

The Efficacy of a Urine Alarm-Based Treatment in  
Youth with Nocturnal Enuresis

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by

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## **Abstract**

Nocturnal enuresis is a common condition that can impact an individual's life in a variety of ways and may continue to do so without effective treatment. Although enuresis is less common in older children, it is often more severe. There is very little research on the efficacy of treatment for nocturnal enuresis in this age group. The aims for the current study were to: determine the efficacy of a urine alarm-based behavioural intervention programme (The Bedwetting Programme) for older children and to explore whether a motivational youth psychoeducation session could impact treatment outcomes. Nine youths aged 11 to 15 years participated in the current study with their primary caregiver(s). Participants completed baseline, treatment, over-learning and follow-up phases. This also included a parent education session, a motivational youth psychoeducation session and the urine alarm. Additional components were used to assist with progress where needed which included retention control training, shaping and night waking schedules. Participants were randomly assigned to one of two treatment order groups: Group One who had the motivational youth psychoeducation session first and Group Two who had the urine alarm first. Treatment performance was measured by the cessation of bedwetting defined as 14 consecutive dry nights, number of wet nights and treatment duration. Participants also completed the Child Behaviour Checklist, the Parenting Scale – Adolescent and a Self-Efficacy Scale to describe the sample through pre- to post-intervention. The behavioural intervention programme was effective for these older children with all of the eight participants who took part, reaching the dryness criterion. The motivational youth psychoeducation session may have had some impact on treatment performance. These findings suggest that this multi-component behavioural intervention programme is an effective form of treatment for older children. The motivational youth psychoeducation session warrants more work to investigate its effect on young people's motivation and performance of treatment.



## Glossary

**The Bedwetting Programme.** The multi-component behavioural intervention programme for nocturnal enuresis, utilised in the current study that incorporated a Parent Session, a Youth Psychoeducation Session and the urine alarm.

**Desmopressin.** An antidiuretic drug that decreases urine production by mimicking a hormone which concentrates urine in the kidneys.

**Dry Bed Training.** A manualised, evidence-based, multi-component, urine alarm treatment package.

**Imipramine.** A tricyclic antidepressant with a side effect of suppressing urinary incontinence.

**Night waking schedule.** Waking the individual at a pre-arranged time to use the toilet.

**Nocturnal Enuresis.** Urinary incontinence at night that occurs at least twice per week for three consecutive months or more.

**Over-learning.** A component that can be used within a wider treatment programme for nocturnal enuresis. Over-learning is implemented after dry criterion is achieved and brings individuals to a higher dry criterion by increasing the pressure to stay dry through consuming large amounts of fluid before bed.

**Parent Session.** An educational session that informed parents on nocturnal enuresis and the multi-component intervention programme (The Bedwetting Programme).

**Retention control training.** An intervention method for nocturnal enuresis that involves consuming large amounts of fluid and withholding urination for as long as possible

**Shaping.** Altering the criterion for a dry night per the progress made with treatment

**Urine alarm.** A device that is designed to sound when the user begins to urinate whilst they are asleep.

**Youth Psychoeducation Session.** An educational and motivational session for youth about their nocturnal enuresis and the multi-component intervention programme (The Bedwetting Programme).

# Chapter 1

## Introduction

Nocturnal enuresis is defined as the release of urine while asleep and can only be diagnosed in children five-years-old and above who experience bedwetting at least twice per week and for three consecutive months or more (American Psychiatric Association, 2013). The condition is common in the clinical setting in New Zealand with reports of 15% of children aged five, 5% of children aged ten and 2% of youth aged 15 years affected by nocturnal enuresis (Continence New Zealand, 2018). Although less common, enuresis is typically more severe and wet nights are usually more frequent in adolescents (Yeung, Sreedhar, Sihoe, Sit, & Lau, 2006).

Children consider bedwetting to be a very difficult issue to deal with (Butler & Heron, 2008). Enuresis can affect people in a variety of ways. The condition has been linked to low self-esteem (Butler, 1998) and social isolation due to fear of the enuresis being detected by others. This can lead to missing out on social events that involve overnight stays such as sleepovers and school camps (Warzak, 1993). Both children and adults with enuresis have more issues at school and work, and experience more depressive problems compared to those without the condition (Nevéus, 2011).

There is a range of treatments for nocturnal enuresis. Some are pharmacological treatments whereas others are psychological. The psychologically based treatment, the urine alarm, is the most effective and evidence-based form of treatment (Bischof & Benson, 2004; Brown, Pope, & Brown, 2011). The urine alarm uses a moisture-sensitive device that when urine comes in contact with it, the electrical circuit is closed, which then sets off an alarm (Bischof & Benson, 2004; Brown et al., 2011; Friman & Jones, 2005). The purpose of the alarm is to wake the individual whenever they begin to urinate. The individual then turns the alarm off and completes a routine specific to their treatment plan (Bischof & Benson, 2004;

Bonser, Jupp, & Hewson, 1990; Freeman, 2004; Friman & Jones, 2005). All treatment using the urine alarm aims to eliminate bedwetting either by inhibiting urination throughout the night or waking to use the toilet (Bischof & Benson, 2004; Butler, 1998; Fritz, Rockney, AACAP, & Work Group on Quality Issues, 2004; Nevéus, 2011). Urine alarm-based treatments usually have a success rate between 60-80% (Bischof & Benson, 2004) with most studies working towards a success criterion of 14 consecutive dry nights.

Many different forms of urine alarm treatment incorporate different components. Furthermore, some treatment packages have been specifically designed such as Dry Bed Training (DBT) which includes components such as retention control training (RCT), night waking schedules and positive reinforcement (Brown et al., 2011). The multi-component behavioural treatment package, used in the current study, is based on DBT with some additional components. This treatment package utilised over-learning which trained participants to a higher criterion to reduce relapse (Brown et al., 2011). In addition, this treatment package utilised an educational parent session and a motivational youth psychoeducation session. The parent session was designed to educate parents on nocturnal enuresis and explain how the treatment package is used. The youth session involved the young person with nocturnal enuresis and their caregiver(s). The aim of the session was similar to the educational parent session, that is to educate on bedwetting and explain the treatment package. However, the youth session had an additional motivation component and used various psychological techniques to increase motivation towards becoming dry. The motivational youth psychoeducation session was the key difference between the intervention programme used in the current study and most other urine alarm-based treatments.

There is currently very little research that focuses on the efficacy of urine alarm-based treatments for adolescents and older children or the impact of youth sessions such as the motivational youth psychoeducation session on treatment performance. The purpose of the

current study was to fill these notable gaps in the research. There were two main aims: to analyse the efficacy of a multi-component behavioural treatment programme for nocturnal enuresis in older children and to assess the impact a motivational youth psychoeducation session had on treatment performance. The researcher believes that this study will provide needed insight into what is an effective form of treatment for nocturnal enuresis in adolescents. In addition, the impact a motivational youth psychoeducation session can have on urine alarm-based treatment performance will be explored.

The research questions listed below will be addressed in the current study:

1. Is the urine alarm-based treatment package: The Bedwetting Programme an effective treatment for nocturnal enuresis in young people aged 11 to 15 years?
2. Does the motivational youth psychoeducation session indicate that it could impact treatment performance?

## Chapter 2

### Literature Review

#### Definition of Enuresis

Nocturnal enuresis is defined as the release of urine while asleep. According to the American Psychiatric Association (2013), Diagnostic and Statistical Manual of Mental Disorders 5<sup>th</sup> edition (DSM-5), to be diagnosed with enuresis, the following criteria must be met: a) repeated voluntary or involuntary wetting into clothes or bed; b) at a frequency of at least twice a week occurring for at least three consecutive months OR presence of clinically significant distress or impairment in social, academic/occupational or other important areas of functioning; c) the individual must be at least 5 years of age (or equivalent developmental level); d) the condition must not be attributable to physiological effects of a substance or another medical condition. In addition, the DSM-5 specifies three subtypes: nocturnal only (wetting only occurring at night during sleep), diurnal only (wetting only occurring during waking hours), and nocturnal and diurnal (a combination of the other two subtypes) (American Psychiatric Association, 2013).

Some also distinguish between primary and secondary enuresis. Primary enuresis occurs in individuals who have never experienced a consistently dry period, whereas secondary enuresis occurs in individuals who experience wetting after a period of dryness for 6 months or more. Psychological trauma is more likely to be an antecedent for secondary enuresis than for primary enuresis; however, this is still uncommon (Fritz et al., 2004). The current study did not distinguish between primary and secondary enuresis. In addition, there have been distinctions between monosymptomatic and polysymptomatic enuresis. Monosymptomatic enuresis is bedwetting without daytime wetting or urology symptoms, whereas polysymptomatic enuresis is associated with daytime wetting, urgency, toilet

frequency or other indications of bladder dysfunction (Butler, Heron, & The Alspac Study Team, 2006). Only young people with nocturnal enuresis were invited to receive treatment in the current study. People with diurnal wetting were screened out in the screening process.

### **Prevalence**

Nocturnal enuresis is common in the clinical setting with a prevalence of 5-10% in 5-year-olds, 3-5% in ten-year-olds and close to 1% of 15-year-olds. In addition, the condition is more common in males compared to females (American Psychiatric Association, 2013; Warzak & Friman, 1994). This has been a consistent finding in the research with some studies reporting ratios from 2:1 to 3:2 (Bischof & Benson, 2004; Brown et al., 2011; Butler et al., 2006; Christophersen & Vanscoyoc, 2013).

### **Aetiology**

**Family history.** Although aetiological factors for enuresis are unclear in the literature, family history has continuously been found to be strongly associated with nocturnal enuresis, suggesting a genetic link (Bischof & Benson, 2004; Gunes, Gunes, Acik, & Akilli, 2009; Nevéus, 2011). The DSM states that the risk of nocturnal enuresis in childhood is 3.6 times higher for individuals who have a maternal history and 10.1 times higher with a paternal history of urinary incontinence (American Psychiatric Association, 2013). Similar findings have been reported by Jarvelin, Vikevainen-Tervonen, Moilanen, and Huttunen (1988), and Warzak and Friman (1994). However, they reported that a maternal history increases the risk of enuresis by five times and a paternal history increases the risk by seven times. In addition, family history of enuresis was a strong predictor for the age of bladder control attainment more broadly (Fergusson, Hons, Horwood, & Shannon, 1987; Nørgaard, Djurhuus, Watanabe, Stenberg, & Lettgen, 1997). Many studies have reported the incidence of enuresis to be at 15% for individuals with no family history, 44% for one parent with a history and 77% for both parents with a history of enuresis (Butler, 1998; Fritz et al.,

2004; Nørgaard et al., 1997; Warzak & Friman, 1994). Jarvelin et al. (1988) found that children with disabilities and children who are late to enter school suffered significantly more from enuresis than other children of a similar age. Houts (1991) reported that family history could account for 10% of the variance in enuresis.

**Gender.** Enuresis tends to be more common in males than females (American Psychiatric Association, 2013; Brown et al., 2011; Nevéus, 2011) in neurotypical samples (Jarvelin et al., 1988). This is consistent with the maturation delay theory, which according to this theory, males generally take longer to achieve developmental milestones than females (Nørgaard et al., 1997). Fergusson et al. (1987), and Warzak and Friman (1994) reported that males attained bladder control moderately slower than females. Many studies have reported nocturnal enuresis to be 2:1-3:2 for males compared to females (Bischof & Benson, 2004; Butler et al., 2006; Doleys, 1977) or prevalence rates of 25% for boys and 15% for girls at 6 years of age, and 8% for boys and 4% for girls at 12 years of age (Christophersen & Vanscoyoc, 2013; Warzak & Friman, 1994). However, one Turkish study found no significant difference between males and females in the prevalence of nocturnal enuresis. (Gunes et al., 2009).

**Developmental immaturity.** Developmental immaturity is another factor that has been found to contribute to the aetiology of nocturnal enuresis (Fritz et al., 2004). In the first three years of life, the rate of physical development was found to significantly predict enuresis (Houts, 1991). In addition, Fergusson et al. (1987) reported that the age of bladder control attainment was significantly predicted by a developmental score at 1 and 3 years of age. Signs of developmental delay are more prevalent in children with nocturnal enuresis such as below average height, low birth weight, less developed mean bone growth and tanner scores, and other signs of neurological delay including dysfunction of fine motor coordination and clumsiness (Nørgaard et al., 1997; Warzak & Friman, 1994). A link has



been found between delayed motor movement and delayed bladder control attainment (Fritz et al., 2004; Nørgaard et al., 1997). Bischof and Benson (2004) stated that with cases of primary enuresis, maturation of the complex neurological mechanism that is needed to attain bladder control is delayed. Individuals with enuresis usually outgrow the condition – 98% by the age of 14 (Bischof & Benson, 2004). In addition, Bischof and Benson (2004) reported that the second and fourth years of life are particularly sensitive in regard to attaining nocturnal bladder control. The ability to stay dry during the night may not be developed in individuals exposed to anxiety-provoking events during these more sensitive years. Despite the research on this theory that developmental delay could be a contributing factor to nocturnal enuresis, the occurrence of dry nights may contradict this. Many individuals who have nocturnal enuresis have periods of dryness which suggests that the mechanism for bladder control is present.

**Physical factors.** Many studies have found a link between a small functional bladder capacity (FBC) and enuresis (Bischof & Benson, 2004; Houts, 1991; Nørgaard et al., 1997; Warzak & Friman, 1994). There have been some studies that have reported smaller FBCs in samples of individuals with enuresis compared to individuals with no enuresis (Houts, 1991). However, there is research that contradicts this claim (Bischof & Benson, 2004; Houts, 1991; Nørgaard et al., 1997; Warzak & Friman, 1994). It can be difficult to differentiate between individuals with and without enuresis using FBC due to the overlap between the two groups (Houts, 1991). Nørgaard et al. (1997) stated that other research shows that individuals with enuresis have normal bladder capacity and enuresis occurred instead when the bladder reached full capacity. In addition, Nørgaard et al. (1997) claimed that children can become dry without their FBC increasing. Small FBC could be a consequence of enuresis rather than a cause (Houts, 1991; Nørgaard et al., 1997). The bladder may not be dilated and stretched during the night which could result in a small FBC. In addition, treatments that target FBC

such as retention control training (RCT) have inconsistent results. Significant improvements in FBC may not improve enuresis (Houts, 1991).

Detrusor overactivity or instability may also contribute to the cause of enuresis. The detrusor muscle can contract before the bladder is full or the muscle may be unstable during sleep (Houts, 1991; Nevéus, 2011; Nørgaard et al., 1997). Detrusor instability is common in infants and has been reported to be a result of incoordination between the muscles that are used when voiding urine. Pelvic floor muscle contractions can occur when voiding, causing the bladder to not be emptied. This leads the individual to experience low FBC, urgency and frequency to use the toilet, incontinence (Nørgaard et al., 1997), and low urine volume from voiding (Butler & Holland, 2000). Increasing water intake can improve bladder instability (Butler & Holland, 2000). One study found that 30-32% of children with nocturnal enuresis from a sample had uninhibited bladder contractions. Another study found that 44% of failed treatment cases had unstable bladder contractions when sleeping which resulted in bedwetting (Butler & Holland, 2000).

Some studies claim that individuals with nocturnal enuresis produce less of the antidiuretic hormone, vasopressin at night – known as polyuria which results in increased urine production (Houts, 1991; Nevéus, 2011). Vasopressin typically rises at night which increases the reabsorption of water – concentrated by the kidneys – causing urine production to decrease (Butler & Holland, 2000). Individuals with polyuria do not produce enough of this hormone during sleep, causing the amount of urine produced to exceed bladder capacity which results in wetting (Houts, 1991). Desmopressin is a drug that can be used to treat enuresis which mimics vasopressin (Butler, 2004). This can help many individuals become dry, particularly those with polyuria. Although, it is important to note that polyuria does not always result in enuresis and not all individuals with enuresis have polyuria (Nevéus, 2011).

**Psychosocial factors.** There is a lack of research that consistently supports the claim that psychosocial and emotional variables contribute to the cause of enuresis (Bischof & Benson, 2004; Houts, 1991). Biological factors are said to be the main cause (Houts, 1991). However, some factors that have been reported to co-exist with enuresis include low socioeconomic status, overcrowding, poor living conditions, separation from siblings, emotional turmoil (including sexual abuse or significant family changes), adaptation to new family structures, disruptive experiences – especially in early years of life and traumatic awareness (Bischof & Benson, 2004; Butler, 1998). The most important risk factor for delayed bladder control attainment was parental divorce during a sensitive stage of bladder control which is 2-3 years of age (Butler, 2004). Breastfeeding and family stability are reported to act as protective factors against enuresis (Butler, 1998). Fergusson et al. (1987) reported that stressful life events in the family, family social background, residential changes, and the number of changes in parental figures are unrelated to the age of bladder control attainment. There are few cases where psychological factors can be identified as contributing to the cause of enuresis; these cases usually involve secondary enuresis (Fritz et al., 2004). It is often difficult to determine which direction the causal relationship is between psychosocial and emotional factors, and enuresis (Bischof & Benson, 2004). Enuresis is usually the cause of psychological distress instead of occurring as a result of distress (Nørgaard et al., 1997). Behaviour theorists have proposed that enuresis is caused by inadequate learning experiences. To eliminate enuresis, the child needs to be exposed to the necessary learning experiences to gain control of their voiding. To achieve this, the child is taught how to address the sensation of a full bladder and to differentiate between appropriate and inappropriate places to void. This is usually done using classical and operant conditioning models through many different forms of treatment (Bischof & Benson, 2004).

**Socioeconomic status.** There is conflicting research on the impact socioeconomic status has on enuresis. There is some correlational evidence such as enuresis being more prevalent in large overcrowded families, low socioeconomic groups and individuals residing in institutions. Living in deprived social conditions may impair growth hormone secretion and vasopressin release. However, some research has failed to find a link between socioeconomic status and enuresis (Nørgaard et al., 1997). Bischof and Benson (2004) proposed that socioeconomic status is unlikely to directly cause enuresis, but it could interact with other factors. For example, cold, poorly lit areas such as the bathroom and a lack of facilities are linked to low socioeconomic status and could lead to increased incidences of enuresis. Another study found that there was no association between fathers' working status, parent education, birth order of the child, the presence of other people sleeping in the child's bedroom and enuresis. However, there was an increased prevalence of enuresis for people with low income, living in villages and families with a history of enuresis (Gunes et al., 2009).

**Sleep patterns.** Parents often think that nocturnal enuresis is caused by heavy sleeping (Butler & Holland, 2000; Warzak & Friman, 1994). However, researchers have found that there is no relationship between the depth of sleep and bedwetting episodes (Houts, 1991). Sleep patterns for individuals with nocturnal enuresis do not differ from individuals without the condition (Butler & Holland, 2000; Houts, 1991). It is instead understood that it is more difficult for an individual with nocturnal enuresis to arise from sleep when the bladder is full (Butler & Holland, 2000; Nevéus, 2011). People without nocturnal enuresis are more likely to wake during the night to use the toilet (Butler & Holland, 2000).

## **The Impact of Enuresis**

**Psychological.** It has been reported that both children and adults with enuresis have more issues at school and work, and experience more depressive problems compared to people without enuresis (Nevés, 2011). The prevalence of psychological symptoms is higher at 20-30% for children with nocturnal enuresis, with attention-deficit/hyperactivity disorder (ADHD) being the most common comorbidity (Niemczyk, Equit, Braun-Bither, Klein, & von Gontard, 2015). Although psychological symptoms have been found to be comorbid with enuresis, they are more common in cases of day wetting and secondary enuresis compared to cases of primary and nocturnal enuresis (Nørgaard et al., 1997). After treatment of enuresis, individuals have been found to show improvement in psychological functioning in areas such as emotional, behavioural, social and self-esteem (Butler, 2004). However, some researchers state that most children who have nocturnal enuresis do not experience psychological disturbance (Butler, 2004).

**Social.** Bedwetting has been perceived as a social problem rather than a health problem (Butler & Heron, 2008; Weaver & Dobson, 2008). Children who have nocturnal enuresis often experience humiliation, a sense of immaturity, fear of the enuresis being discovered by others, feeling different from other children and are bullied (Butler, 1998, 2004; Nørgaard et al., 1997; Warzak, 1993; Weaver & Dobson, 2008). In addition, children often experience social isolation, usually due to their fear of others discovering their enuresis. This results in the child feeling unable to stay the night at a friend's house or to invite a friend to visit their house because they are worried that their bedroom may smell (Butler, 1998; Nørgaard et al., 1997; Warzak, 1993; Weaver & Dobson, 2008). Children with nocturnal enuresis often miss out on social activities that involve overnight stays such as school trips or school camps (Warzak, 1993; Weaver & Dobson, 2008). Teenagers also frequently mentioned the issue of being unable to participate in these social activities (Butler & Heron,

2008). This social exclusion can harm self-esteem and confidence which can continue into adulthood (Weaver & Dobson, 2008). Some research has indicated that in younger age groups, parents and children who have enuresis report higher levels of psychological and behavioural problems (Weaver & Dobson, 2008). A study with a sample of over 2,000 school children discovered that children ranked 'wetting pants in class' third for the most stressful event, which was only ranked behind 'going blind' and 'losing a parent' (Weaver & Dobson, 2008). Children who experience enuresis are aware that this causes an extra burden for their parents due to the extra work and expense from bedwetting (Nørgaard et al., 1997). Enuresis can be a higher risk for developing psychiatric problems when the individual experiences short intervals of dryness (Nørgaard et al., 1997).

**Social/emotional adjustment.** Most studies conclude that there is no difference for social and emotional adjustment in individuals with enuresis compared to those without the condition (Butler, 1998, 2004; Warzak & Friman, 1994). However, one Turkish study stated that for children who continue to have problems with bedwetting, the condition may result in social and emotional problems (Gunes et al., 2009). Children with nocturnal enuresis were found to be within the normal range for social and emotional adjustment according to self-report questionnaires (Butler, 1998). In addition, Warzak and Friman (1994) reported that most children with enuresis do not exhibit greater emotional distress or significant psychiatric difficulties compared to children who do not have enuresis. However, girls and individuals with daytime or secondary enuresis have an increased risk of physical or emotional abuse and may be more vulnerable to emotional distress (Butler, 1998).

**Behaviour problems.** Some studies have found correlations between nocturnal enuresis and behaviour problems (Redsell & Collier, 2001). Butler (1998) reported that some research indicates that children with the condition were more likely to produce higher scores for troubling behaviours and would show a behaviour problem increase. A study conducted

by Niemczyk et al. (2015) found that externalising disorders were more prevalent in children who had nocturnal enuresis with a rate of 14.2% compared to those without the condition with a rate of 9.5%. More specifically, ADHD and Oppositional Defiant Disorder (ODD) were more prevalent in children with nocturnal enuresis with rates of 8.8% and 9.7% respectively compared to children without the condition with rates of 6.2% and 5.9%. Two New Zealand studies have examined behaviour problems and their correlation with enuresis. Both studies found children 11-13 years of age with secondary enuresis experienced increased rates of behaviour problems (Feehan, McGee, Stanton, & Silva, 1990; Fergusson & Horwood, 1994). Fergusson and Horwood (1994) found that both primary and secondary enuresis were associated with behaviour problems, however, Feehan et al. (1990) found lower rates for individuals with primary enuresis. Other studies have also reported that behaviour problems are more likely to develop in older children, particularly over 8 years of age (Butler, 2004; Redsell & Collier, 2001). Behaviour problems are also more prevalent for those who experience a larger number of episodes of enuresis and those with daytime incontinence (Redsell & Collier, 2001). Despite these findings, many studies have claimed that enuresis does not lead to behaviour problems or maladjustment (Butler, 1998, 2004; Redsell & Collier, 2001; Warzak, 1993). Warzak (1993) stated that children with enuresis do not experience more behavioural pathology compared to children who do not have the condition. Redsell and Collier (2001) commented on the relationship in the other direction, stating that there is little research that demonstrates behaviour problems result in nocturnal enuresis.

**Self-esteem.** Many children with enuresis have low self-esteem while they experience bedwetting (Butler, 1998; Nevéus, 2011; Redsell & Collier, 2001). Low self-esteem from nocturnal enuresis has been reported to occur in specific areas of functioning including perceived physical appearance and social competence (Butler, 1998). Most people who have

nocturnal enuresis are unaware of how common the condition is, and families usually try to keep the condition unknown to others. This can lead the individual with nocturnal enuresis to feel that they are different. All of these factors can result in diminished self-esteem that can make the treatment of nocturnal enuresis more complex (Warzak, 1993; Warzak & Friman, 1994). However, despite the research on the impact enuresis has on self-esteem, some studies state that the research does not indicate that bedwetting results in low self-esteem (Butler, 2004; Redsell & Collier, 2001).

**Perceived difficulty.** Children – especially those with nocturnal enuresis – consider wetting the bed to be a difficult issue for someone to experience (Butler & Heron, 2008).

Butler and Heron (2008) found that 36.7% of children considered bed wetting to be very difficult and was ranked eighth in difficulty behind social and schooling events. Another study found that 57.1% of children with nocturnal enuresis and 46.4% of parents said they were significantly concerned about the impact enuresis has on their life (Gunes et al., 2009).

**Differential impacts on boys and girls.** Boys and girls with enuresis have different experiences with the condition. Girls are significantly more at risk of physical or emotional abuse, developing psychiatric disorders, and are more vulnerable to emotional distress and low self-esteem compared to boys (Butler, 1998; Nørgaard et al., 1997; Weaver & Dobson, 2008). In addition, girls and boys view nocturnal enuresis differently. Boys perceive bedwetting to be a significantly more difficult problem compared to girls. Although, this could be because nocturnal enuresis is more prevalent in boys. Boys were more likely to view antisocial factors as more difficult, whereas girls were more likely to view emotional and social factors as more difficult (Butler & Heron, 2008).

**Differential impacts on younger and older children.** Older children tend to experience nocturnal enuresis differently compared to younger children. One study has reported that children over the age of 10 years with a form of enuresis are more vulnerable to



low self-esteem and emotional distress. Girls, people with secondary enuresis and daytime wetters are also more vulnerable (Weaver & Dobson, 2008). Behaviour problems in children with nocturnal enuresis are more common in children over 8 years of age (Redsell & Collier, 2001). In addition, Butler (2004) reported that older children with nocturnal enuresis experienced more psychological issues compared to younger children, and younger children were more concerned about the immediate consequences of nocturnal enuresis.

**Impact on parents and the parent/child relationship.** Most parents of children who have nocturnal enuresis are concerned about the impact the condition has on their child (Butler, 2004). Parents worry about their child's well-being in particular, even more so if the condition has an emotional aetiology (Nørgaard et al., 1997). Parents typically know little about what causes enuresis and often incorrectly assume that developmental delay, poor parenting skills or stubbornness cause the enuresis (Warzak & Friman, 1994). Parental intolerance of their child's enuresis can occur. Decreased tolerance has been found to correlate with increased anger, increased parental stress, increased age of the child with enuresis and the perception that the cause of the enuresis is within the child's control (Butler, Brewin, & Forsythe, 1986). These parents are more concerned about the burdens from the enuresis such as extra washing, the financial burden and the smell, and believe that the condition is caused by controllable variables such as the child's behaviour (Butler, 2004). Punishment of the child for bedwetting is used by some parents (Butler, 2004; Warzak, 1993; Warzak & Friman, 1994). Parental intolerance of nocturnal enuresis is a cause for concern as it increases the risk of withdrawal from urine alarm-based treatments (Butler, 2004). Parents can have many misconceptions about enuresis which can have a negative impact on the child. Some of these can include the belief that enuresis reflects negatively on parenting skills or that the bedwetting is intentional. This can result in the parent using coercion and punishment to correct the inappropriate behaviours. These combined factors can lead to less positive

parent-child interactions and a stressful home environment which, in turn, can impact daily functioning, even more so for children who have been referred to receive treatment (Warzak, 1993; Warzak & Friman, 1994).

## **Treatment**

There is a range of psychological and pharmacological interventions that can be used to treat enuresis. For both kinds of intervention, there is evidence that the intervention produces better results than controls. However, children were more likely to eliminate bedwetting if they received a drug called desmopressin or the urine alarm compared to other forms of treatments (Houts, Berman, & Abramson, 1994). Desmopressin reduces wet nights rapidly once implemented; however, this is not typically sustained long term as desmopressin reduces symptoms rather than resolves the enuresis (Brown et al., 2011). Overall, the urine alarm and other psychological treatments are generally more effective compared to pharmacological based treatments. Results are superior and more likely to be maintained at follow-ups compared to desmopressin as well as other pharmacological treatments (Houts et al., 1994). However, it is important to note that these treatments were compared across studies (Houts et al., 1994). This can raise some issues with comparisons because participants and treatment conditions may have been handled differently across the studies which could impact results.

**Medication.** Two medicines commonly used to treat enuresis are desmopressin and imipramine. Desmopressin is an antidiuretic and is a synthetic version of the naturally occurring hormone vasopressin (Bischof & Benson, 2004; Brown et al., 2011; Butler, 2004; Fritz et al., 2004; Nevéus, 2011; Warzak & Friman, 1994). Some evidence shows that the vasopressin hormone may not have the same increase at night in children with compared to children without nocturnal enuresis (Brown et al., 2011; Butler, 2004; Christophersen & Vanscoyoc, 2013). Desmopressin works by mimicking this hormone, resulting in decreased

urine production and increased urine concentration (Bischof & Benson, 2004; Brown et al., 2011; Butler, 2004; Fritz et al., 2004; Nevéus, 2011; Warzak & Friman, 1994). Imipramine, on the other hand, is a tricyclic antidepressant that was discovered to have a side effect of eliminating incontinence. An adult who suffered from depression and incontinence was prescribed the drug in the 1960s and became continent from taking imipramine (Brown et al., 2011; Houts, 1991). The mechanisms for how imipramine affects bladder control are still largely unknown (Brown et al., 2011; Friman & Jones, 2005; Fritz et al., 2004; Houts, 1991; Nevéus, 2011; Wagner, 1987; Warzak & Friman, 1994).

***Desmopressin.*** Desmopressin can be taken either as an intranasal spray or as a tablet before bed (Fritz et al., 2004). Desmopressin concentrates the urine in the kidneys resulting in less urine production after the drug is administered (Houts, 1991). Due to the rapid onset of the drug, especially compared to psychological treatments such as the urine alarm (Brown et al., 2011; Butler, 2004), desmopressin is particularly useful in cases where there is a strong need for rapid elimination of bedwetting (Butler, 1998, 2004). However, the poor long-term efficacy of desmopressin and other pharmacological treatments still needs to be considered (Christophersen & Vanscoyoc, 2013). One criticism of pharmacological treatments is that they do not allow the recipient to learn and practice the skills, such as sensory awareness, required to achieve continence. Once the drug is removed, incontinence usually returns (Friman & Jones, 2005).

Desmopressin has very few side effects (Brown et al., 2011; Butler, 2004; Nevéus, 2011; Warzak & Friman, 1994) and has fewer side effects compared to antidepressants that can be used to treat nocturnal enuresis such as imipramine (Brown et al., 2011). However, one rare side effect which can occur with desmopressin is seizures. This is caused by excessive drinking at the time of taking the drug, which can cause water intoxication and abnormal electrolytes, resulting in seizures (Brown et al., 2011; Fritz et al., 2004; Nevéus,

2011). It is usually recommended that fluid intake be restricted 1 hour before bed and throughout the night (Butler, 2004).

Desmopressin has been found to be more effective than a placebo (Butler, 2004); however, reported results are inconsistent and are reported in different ways. Some studies have reported 24.5-34% cessation of bedwetting (Butler, 2004; Houts, 1991; Meltzer & Crabtree, 2015), other studies have reported a 70% response rate (Butler, 2004), 10-65% success rates (Fritz et al., 2004), and a 10-91% reduction in wet nights (Brown et al., 2011; Warzak & Friman, 1994) or a reduction of 2.07 nights per week. A summary of these findings can be found in Table 1. Bedwetting is not usually eliminated when using desmopressin and the drug may need to be taken continuously for results to be sustained (Warzak & Friman, 1994). Meltzer and Crabtree (2015) reported that 30-40% of people do not respond to desmopressin at all. However, it has been reported that desmopressin is more efficacious compared to imipramine (Butler, 2004).

Table 1

*Summary of Desmopressin Efficacy*

	Response/Success Rate	Reduced wet nights	Cessation
Butler (2004)	70.0% (RR)		24.5%
Brown et al. (2011)		50.0%	
Fritz et al. (2004)	10.0-65.0% (SR)		
Houts (1991)		2.07 nights per week*	34.0%
Warzak and Friman (1994)		10.0-91.0%	
Meltzer and Crabtree (2015)			30.0%

*Note.* RR = response rate; SR = success rate; \* average reduction of wet nights per week.

Relapse is an important problem to consider with regards to desmopressin as relapse is almost certain with the removal of the drug (Brown et al., 2011; Meltzer & Crabtree, 2015). Desmopressin usually only reduces symptoms of enuresis, rather than eliminating

them (Brown et al., 2011). Reported relapse rates have ranged from 46-100% (Fritz et al., 2004; Houts, 1991). Some researchers have suggested removing desmopressin by gradually reducing the dose. However, it is argued that this puts too much focus on the medication as the main cause for the reduction in wet nights and usually only reduces the relapse rate to 50% at most (Butler, 2004). Desmopressin (and other pharmacological options) are more appropriate when the recipient needs immediate results; however, these results are unlikely to be maintained. For a longer-term solution for nocturnal enuresis, behavioural interventions are a better option (Meltzer & Crabtree, 2015).

***Imipramine.*** Imipramine is thought to somehow make the bladder less sensitive to becoming full which enables it to hold more fluid before the feeling of needing to use the toilet arises (Friman & Jones, 2005). Another theory is that imipramine works as a stimulant which makes it easier to wake when the urge to urinate arises as sleep levels are lighter (Brown et al., 2011). Warzak and Friman (1994) reported three theories for the mechanisms of action for imipramine: anticholinergic and/or antispasmodic effect, rapid eye movement (REM) sleep, and increases in antidiuretic hormone levels. Anticholinergic and antispasmodic effects lead to some relaxation of the bladder muscles which inhibits contractions of the bladder that usually result in incontinence (Houts, 1991; Warzak & Friman, 1994). However, Fritz et al. (2004) stated that the anticholinergic effect does not adequately explain how imipramine works. It is proposed that tricyclics such as imipramine have an impact on REM sleep by altering the stages of sleep, which may disrupt episodes of enuresis (Warzak & Friman, 1994). Although, Fritz et al. (2004) reported that, in addition to the anticholinergic effect, changes in REM sleep do not adequately explain how imipramine works. Other evidence suggests that imipramine may cause levels of the antidiuretic hormone to increase. This relates to the mechanism for desmopressin; however, these findings do not

have as much evidence behind this claim compared to desmopressin (Warzak & Friman, 1994).

There is a range of side effects reported for imipramine. Some of these side effects include sleep disturbance, depression, agitation, lethargy, drowsiness, gastrointestinal disturbance, dizziness, irritability and mood changes (Bonser et al., 1990; Christophersen & Vanscoyoc, 2013; Nevéus, 2011). In addition, there is a risk for overdose when using imipramine (Christophersen & Vanscoyoc, 2013) that can lead to cardiac failure (Houts, 1991) which can result in death (Nevéus, 2011). These deaths are reportedly often due to a pre-existing cardiac arrhythmia combined with taking imipramine. It is suggested that a pre-treatment electrocardiogram should be carried out when considering imipramine to establish whether there is a rhythm disorder, and this should also be monitored throughout treatment with imipramine (Fritz et al., 2004).

Imipramine has proven to be effective for nocturnal enuresis when compared to placebo and no treatment control groups (Bonser et al., 1990; Fritz et al., 2004; Houts, 1991; Warzak & Friman, 1994). Results for imipramine are reported differently across studies. Success rates that range from 20-80% (Bischof & Benson, 2004; Bonser et al., 1990; Brown et al., 2011), a response rate of 50% (Nevéus, 2011), reduction in wet nights at 2.1 nights per week (Houts, 1991) and cessation of bedwetting at 50% (Houts, 1991) and 25% (Wagner, 1987) have been reported. It is important to note that the rate of 25% cessation of wetting came from a review that reported only 2 articles above 25% cessation (Wagner, 1987). A summary of these findings can be found in Table 2.

Table 2

*Summary of Imipramine Efficacy*

	Rate	Reduced wet nights	Cessation
Bischof and Benson (2004)	40-80% (SR)		
Nevéus (2011)	50% (RR)		
Bonser et al. (1990)	30% (SR)		
Brown et al. (2011)	20-43% (SR)		
Fritz et al. (2004)	40-60% (E)		
Houts (1991)		2.1 nights per week	50%
Wagner (1987)			25%

*Note.* SR = success rate; RR = response rate; E = effectiveness;

Relapse is an issue that needs to be considered regarding imipramine. The relapse rate is consistently reported to be high by researchers following medication removal (Bischof & Benson, 2004; Bonser et al., 1990; Brown et al., 2011; Christophersen & Vanscoyoc, 2013; Fritz et al., 2004; Wagner, 1987; Warzak & Friman, 1994). Brown et al. (2011) reported that at follow-up, results often showed no improvement from baseline placebo. The relapse rates vary across the studies. Fritz et al. (2004) reported a relapse rate of 50%, Houts (1991) reported that 70-90% of those who became dry remitted one year later and Bonser et al. (1990) reported a relapse rate of 95%. In addition, Warzak and Friman (1994) reported that when the medication was removed 5-40% of children remained dry. Considering the high relapse rates, imipramine may be best for circumstances where a temporary, quick fix is needed (Wagner, 1987). However, considering the side effects (Christophersen & Vanscoyoc, 2013), desmopressin may be a better option.

Overall, pharmacological treatments may show some efficacy for treating nocturnal enuresis, however, this is not sustained for the long-term, especially when compared to behavioural interventions such as the urine alarm. Friman and Jones (2005) proposed that pharmacological treatments do not allow the recipient to learn continence skills or practice

appropriate responses and it could reduce sensory awareness. Considering the high relapse rates, pharmacological treatments are most appropriate to use to provide relief from the symptoms of nocturnal enuresis rather than permanently remedying the condition.

Psychological treatments are generally more effective compared to pharmacological ones and tend to work to a stricter criterion of eliminating bedwetting, defined as 14 days dry, whereas pharmacological treatments tend to focus on reducing bedwetting (Friman & Jones, 2005).

**Retention control training.** RCT involves consuming larger amounts of water and withholding urination for as long as possible (Bischof & Benson, 2004; Bonser et al., 1990; Brown et al., 2011; Butler, 1998; Doleys, 1977; Friman & Jones, 2005; Wagner, 1987; Warzak & Friman, 1994). There has been some evidence that suggests that children who have nocturnal enuresis also have a small FBC (Brown et al., 2011). Increases in FBC have been linked to improvements in enuresis (Doleys, 1977). RCT aims to increase FBC (Doleys, 1977; Fritz et al., 2004) by delaying urination (Friman & Jones, 2005). RCT attempts to help the individual adapt to increased bladder volumes by training the detrusor muscles. This increases the amount of urine that the bladder can hold (FBC) and makes the individual more aware of bladder sensations (Butler, 1998). However, some research suggests that increases in FBC may not result in decreased bedwetting (Fritz et al., 2004; Wagner, 1987; Warzak & Friman, 1994). The procedure has also been noted to be distressing as withholding urination is unpleasant for all involved in the exercise (Fritz et al., 2004; Warzak & Friman, 1994).

The evidence on RCT is inconsistent. Success rates have been reported from 33% to 50% (Bonser et al., 1990; Brown et al., 2011; Warzak & Friman, 1994) and one study reported no relapse at three months (Bonser et al., 1990). However, some research has found that whilst RCT may increase FBC, it does not impact on enuresis (Bonser et al., 1990; Brown et al., 2011; Butler, 1998). The exercise can be used in conjunction with the urine alarm; however, Butler (1998) states that this does not prevent relapse. Warzak and Friman



(1994) stated that RCT is not as effective as the urine alarm treatment and this may be due to the exercise indirectly impacting on nocturnal enuresis as it occurs during the day while the bedwetting occurs at night.

**Over-learning.** Over-learning is not a stand-alone treatment but is used in conjunction with other treatments such as the urine alarm to decrease the relapse rate (Brown et al., 2011; Butler, 2004; Christophersen & Vanscoyoc, 2013). Over-learning is carried out after successful treatment and brings the individual up to a higher criterion of dryness. This involves drinking larger amounts of fluid, shortly before bed each night, making it more difficult to stay dry as it puts more pressure on the bladder to increase FBC. The over-learning often results in relapse and is continued until the dry criterion is met again (Brown et al., 2011; Butler, 1998, 2004; Christophersen & Vanscoyoc, 2013; Friman & Jones, 2005).

There is evidence that over-learning can improve the rate of relapse for nocturnal enuresis. Relapse rates have been reported to be 20-40% with no over-learning (Brown et al., 2011) which then drop to 10-12% with over-learning (Brown et al., 2011; Butler, 1998, 2004). In addition, Robertson, Yap, and Schuster (2013) reported that at baseline there were 5.13 wet nights per week which decreased to 1.88 nights per week in the treatment phase, which decreased again to 0.64 in the over-learning phase. In another sample, 48 children had reached dry criterion with one child relapsing at the one-year follow-up (Christophersen & Vanscoyoc, 2013). Interestingly, Butler (2004) reported that no evidence shows over-learning increases FBC.

**Arousal training.** Arousal training is used in conjunction with the urine alarm to ensure that the child is completely aroused when the alarm is triggered so that learning can occur (Brown et al., 2011; Butler, 2004). Appropriate behaviour in response to the urine alarm is reinforced (Butler, 1998, 2004). This behaviour includes waking, using the toilet, returning to bed and resetting the alarm immediately when the alarm sounds. Parents need to

ensure that their child wakes if the alarm is not waking them (Brown et al., 2011). There is evidence for the efficacy of arousal training with success rates reported at 79-98%. One study was reported to find a 98% success rate with arousal training and a 73% success rate without arousal training (Butler, 2004). Butler (1998) reported that relapse rates were low with 73% of children remaining dry at the 2 ½ year follow-up.

**Night waking schedule.** When using night waking schedules, the individual is woken at an arranged time to use the toilet (Freeman, 2004; Friman & Jones, 2005; Warzak & Friman, 1994). Other components can be used in conjunction with the treatment such as positive reinforcement. The night waking schedule is phased out as success is achieved (Warzak & Friman, 1994). This is usually done by delaying the time of the waking as more dry nights occur. The waking time is made earlier if wet nights occur (Freeman, 2004). It is reported that dryness is achieved due to more accessible reinforcement properties for dry nights, more awareness of the urge to empty the bladder during the lighter sleep stages and changes to arousal (Friman & Jones, 2005). There are mixed reports on the efficacy of night waking schedules. Some have reported that wetting is reduced and sometimes eliminated whilst others have reported that researchers have questioned the efficacy (Warzak & Friman, 1994). In a case study, the night waking schedule decreased but did not eliminate wetting (Freeman, 2004). The evidence suggests that night waking schedules are usually not as effective as the urine alarm, however it can be used as part of a urine alarm treatment package (Freeman, 2004).

**Cleanliness training.** Cleanliness training is used in conjunction with other treatments such as the urine alarm and takes place after the wetting has occurred. The individual completes a routine where they remove any wet bedding and clothing, clean themselves, put on new pyjamas and make their bed with clean sheets. This exercise is

designed to allow the child to take responsibility for their journey to becoming dry and also acts as a form of punishment for wetting (Brown et al., 2011).

### **Youth Psychoeducation Sessions**

There is very little research on youth psychoeducation sessions that aim to educate and motivate the child towards becoming dry. Some studies have used child interviews; however, these interviews usually have a different purpose to a motivational youth psychoeducation session, such as the one from the behavioural intervention used in the current study. One study used an interview with the child and their parent to determine what factors, such as motivation and family history, could affect the performance of the urine alarm treatment. These analyses were minimal and did not provide specific findings on how each factor affected performance (Bath, Morton, Uing, & Williams, 1996). A study conducted by Bollard and Nettelbeck (1981) included an interview with the child and a parent. However, the purpose of this interview was only to familiarise the family with the treatment. The alarm was demonstrated, and written instructions were provided that outlined procedures. This interview was not assessed in the analyses. Butler, Brewin, and Forsythe (1988) interviewed the child without a parent present to determine how the child perceived bedwetting. This interview involved questions targeting what they believed the causes for bedwetting were and what their reaction to bedwetting was. The interview was centred around gathering more data on the child, rather than providing an additional component to the treatment, such as assistance with motivation. The factors that came from the interviews were analysed against treatment outcomes and the only factor found to be significantly related to better treatment outcomes was being teased by siblings. Research on how sessions that educate and motivate participants receiving the urine alarm treatment is lacking. Further research is needed to determine what impact a session such as a motivational youth psychoeducation session, has on treatment performance.

## Urine Alarm

There are many different types of urine alarm treatment. Some are more basic treatments that use the urine alarm and the standard routines around this, some are treatment packages that incorporate these standard routines with other components such as positive reinforcement or RCT. Others urine alarm treatments are specifically developed treatment packages such as Dry Bed Training (DBT) and Full Spectrum Training which also use the basics from the standard urine alarm treatment.

### **Description.**

**Urine alarm.** The urine alarm is used in basic urine alarm treatments and built on in package interventions such as DBT. The urine alarm uses a moisture-sensitive device, usually a pad, that is connected to an alarm and placed on the bed or in the pyjamas. When urine comes in contact with the device, the electrical circuit is closed which then sets off the alarm (Bischof & Benson, 2004; Bonser et al., 1990; Brown et al., 2011; Freeman, 2004; Friman & Jones, 2005; Fritz et al., 2004; Nevéus, 2011). The purpose of the alarm is to wake the individual whenever they begin to urinate. The individual then turns the alarm off and completes a routine specific to their treatment plan which usually includes getting out of bed, finishing or attempting urination in the toilet and replacing any wet pyjamas or bedding (Bischof & Benson, 2004; Bonser et al., 1990; Freeman, 2004; Friman & Jones, 2005). All treatment using the urine alarm aims to eliminate bedwetting either by inhibiting urination throughout the night or waking to use the toilet (Bischof & Benson, 2004; Butler, 1998; Fritz et al., 2004; Nevéus, 2011). The alarm is usually removed after 14 consecutive nights dry (Bonser et al., 1990).

There are several theories on how the urine alarm works. Classical conditioning, conditioned avoidance and operant conditioning are the main theories that are conceptualised by researchers which may also work together. According to the classical conditioning theory,

it is thought that the alarm is the unconditioned stimulus, a full bladder is the conditioned stimulus and waking or pelvic floor muscle contraction used to hold urine is the conditioned response. The alarm is continuously paired with voiding until the response of waking to use the toilet or contracting muscles comes before the voiding (Brown et al., 2011; Butler, 1998, 2004; Forsythe & Butler, 1989; Freeman, 2004; Friman & Jones, 2005; Meltzer & Crabtree, 2015; Warzak & Friman, 1994). The conditioned avoidance theory proposes that the urine alarm is an aversive stimulus which produces a conditioned avoidance response involving contraction of the pelvic floor muscles and the bladder external sphincter. The individual is abruptly woken by the alarm which causes muscle contraction, resulting in the interruption of urine flow (Bonser et al., 1990; Brown et al., 2011; Butler, 1998, 2004; Forsythe & Butler, 1989). Operant conditioning theory suggests, similarly to conditioned avoidance, that the unpleasant consequences of waking to the alarm and changing bedding are avoided by the individual throughout the night by waking or holding onto urine. Dryness is maintained through increased sensory awareness of the need to urinate, resulting in the contraction of pelvic floor muscles or waking to void. This is negatively reinforced by not waking to the alarm or having wet bedding (Brown et al., 2011; Freeman, 2004; Friman & Jones, 2005; Warzak & Friman, 1994). It is still largely unclear and disputed as to how the urine alarm works. The majority of people become dry due to learning to hold urine throughout the night rather than waking to void. This makes the mechanisms for the alarm's efficacy unclear as it can be theoretically assumed that the urine alarm would teach the individual to wake when they have a full bladder as this is what occurs throughout the treatment (Butler, 1998; Nevéus, 2011). It is then proposed that the role of the alarm is to alert the individual to the sensation of a full bladder so that urination can be inhibited and waking to void does not need to occur (Butler, 2004; Forsythe & Butler, 1989; Meltzer & Crabtree, 2015). It has been

claimed that FBC increases throughout the urine alarm treatment as a result of holding urine (Forsythe & Butler, 1989).

***Urine alarm treatment packages.*** The urine alarm is rarely used on its own. Typically, at least some basic components are added such as cleanliness training which may act as a form of positive punishment and involves taking responsibility for cleaning any wet items, and reinforcement for dry nights through sticker charts or praise for any improvement. It is important that the child remains engaged and motivated throughout treatment (Freeman, 2004; Fritz et al., 2004; Warzak & Friman, 1994).

In other treatment packages, some larger components are used along with the urine alarm. RCT is often used within urine alarm treatment packages to expand FBC and involves consuming large amounts of urine and withholding urination for as long as possible (Friman & Jones, 2005). Over-learning is often used at the end of the urine alarm treatment packages after dry criterion has been achieved. It involves consuming larger amounts of water before bedtime. This aims to bring the individual to a higher criterion so that treatment effects are more likely to be maintained (Brown et al., 2011; Friman & Jones, 2005; Fritz et al., 2004). In addition, waking schedules are often added to urine alarm treatment packages. The individual is woken before they wet so that they can urinate in the toilet. This procedure claims to change the arousal so that the individual is more aware of the urge to urinate and provides greater access to positive reinforcement (Friman & Jones, 2005). Visual sequencing is often used in urine alarm treatment packages and involves visualising the sequence of behaviours that are needed to become dry. First, the urge to urinate needs to be detected, then the pelvic floor muscles are contracted so that the individual can either hold their urine or empty their bladder appropriately (Friman & Jones, 2005). Responsibility training is a common concept that is used in most treatments using the urine alarm. Independence is strongly encouraged in the child. Items that do not promote this such as diapers are removed.

The individual is expected to take responsibility for anything associated with wet nights. However, these responsibilities are not a punishment, rather they are used to promote respect and maturity (Friman & Jones, 2005). Despite all additional components in urine alarm treatment packages, evidence indicates that the alarm is the necessary element for successful treatment (Houts, 1991).

***Dry Bed Training.*** DBT is a manualised, multi-component, evidence-based treatment package. The urine alarm is the main element to the treatment and is used with a night-time waking schedule, RCT, positive practice, cleanliness training, increased fluid intake and positive reinforcement (Bischof & Benson, 2004; Bonser et al., 1990; Brown et al., 2011; Butler, 2004; Christophersen & Vanscoyoc, 2013). The night-time waking schedule used in DBT requires the child to be woken throughout the night (Brown et al., 2011). Positive practice requires the child to repeat the sequence of lying in bed with the lights off as if they are sleeping, getting out of bed and using the toilet. This practice was often done before bed (Bonser et al., 1990; Brown et al., 2011; Butler, 2004). Positive reinforcement often utilises sticker charts and rewards for dry nights (Brown et al., 2011). Earlier methods for DBT utilised special trainers to carry out an intensive night-waking schedule for the first night of treatment, however, this was modified so that the parents could conduct the treatment programme with the support from a professional (Bonser et al., 1990).

Some research has been conducted to determine which components of DBT are the necessary ingredients to produce desired results, however, findings are conflicting. It has been proposed that removing the urine alarm component only slightly reduces the efficacy of the treatment as most observed improvements in nocturnal enuresis are due to positive reinforcement for dry nights, not the conditioning from the alarm (Bonser et al., 1990). However, others have proposed that the urine alarm is the key component and is responsible for most of the treatment success. It is suggested that some of the other, more burdensome

components such as the night waking schedule could be removed from the treatment package, possibly without altering the efficacy of the treatment (Bonser et al., 1990; Butler, 2004).

DBT has had some criticism due to its complexity and difficulty for families to carry out all of the components, particularly the night waking schedule that can require individuals to wake every hour for the first night of treatment. Families need to be highly motivated for the treatment to be a success (Bischof & Benson, 2004; Brown et al., 2011). It has been advocated that any components that are not necessary for success be removed so that minimal stress is put on families. Some research has proposed that treatment which incorporates the urine alarm and RCT when FBC is low is the most effective form of treatment (Bonser et al., 1990; Butler, 2004).

***Full Spectrum Training.*** Full Spectrum Training, sometimes referred to as Full Spectrum Home Training or Full Spectrum Home Therapy, is another manualised, multi-component treatment package. The urine alarm again is the main component to this treatment package, which is used alongside RCT, cleanliness training, positive reinforcement and over-learning (Brown et al., 2011; Butler, 2004; Meltzer & Crabtree, 2015). The additional components that are used alongside the urine alarm support the individual to reach the dry criterion more rapidly and reduce the relapse rate. RCT specifically as an additional component has not demonstrated improved success in treatment, however, it has been shown to reduce relapse rates. Similarly, over-learning can result in increased treatment failure, although this also has led to lower relapse rates (Meltzer & Crabtree, 2015).

### **Efficacy.**

***Urine alarm.*** The urine alarm is the ‘gold standard’ treatment for nocturnal enuresis and is found to produce significantly improved results compared to controls (Butler, 1998, 2004; Christophersen & Vanscoyoc, 2013). Comparative trials have shown that treatments



with the urine alarm are superior to a range of other treatments such as drug treatments, RCT and talk therapy. Some trials claimed that the urine alarm is more effective than any other treatment method considering success and relapse rates (Butler, 1998, 2004; Christophersen & Vanscoyoc, 2013; Friman & Jones, 2005). It has been reported that bedwetting was two times more likely to be eliminated in individuals who received the urine alarm as treatment compared to individuals who received different treatment (Butler, 1998, 2004). In a Cochrane review, reported on by Meltzer and Crabtree (2015), 56 trials supported the urine alarm as an effective treatment for nocturnal enuresis with approximately two-thirds of participants becoming dry. However, it was noted that this treatment has a long duration, usually between 5 and 12 weeks (Brown et al., 2011; Butler, 1998, 2004; Christophersen & Vanscoyoc, 2013; Houts, 1991). The efficacy of the urine alarm treatment has been reported in many different ways including a response rate between 50 and 80% (Nevéus, 2011), 65-75% effective (Brown et al., 2011; Butler, 1998, 2004), and success rates between 60 and 80% (Bischof & Benson, 2004; Bonser et al., 1990; Brown et al., 2011; Christophersen & Vanscoyoc, 2013; Houts, 1991). A summary of these findings can be found in Table 3. It is important to consider relapse rates when discussing the efficacy of any treatment. Relapse is probable when using the urine alarm, however, most individuals will regain continence after the urine alarm treatment is reintroduced (Bonser et al., 1990; Christophersen & Vanscoyoc, 2013; Warzak & Friman, 1994). There is a range of relapse rates reported across the literature which can be between 15 and 46% (Bonser et al., 1990; Brown et al., 2011; Butler, 1998, 2004; Christophersen & Vanscoyoc, 2013; Meltzer & Crabtree, 2015). In a review of 56 trials, it was reportedly found that the relapse rate was 45% (Meltzer & Crabtree, 2015). Some other studies have reported rates between 15 and 30% at 6-month follow-ups (Brown et al., 2011; Butler, 1998, 2004). These relapse rates are summarised in Table 3.

Table 3

*Summary of Urine Alarm Efficacy*

Study	Response rate	% Effective	Success Rate	Relapse Rate
Nevéus (2011)	50.0-80.0%			
Butler (1998)		65.0-70.0%		15.0-30.0%
Butler (2004)		65.0-70.0%		15.0-30.0%
Brown et al. (2011)		65.0-75.0%	77.9%	15.0-30.0%
Christophersen and Vanscoyoc (2013)			75.0%	46.0%
Bischof and Benson (2004)			60.0-80.0%	
Bonser et al. (1990)			75.0%	40.0%
Houts (1991)			77.0%	
Meltzer and Crabtree (2015)				45.0%

***Urine alarm treatment packages.*** The urine alarm on its own, or as part of a treatment package has been found to be an effective treatment (Brown et al., 2011). Many researchers have reported that treatments utilising the urine alarm are more effective than any other treatment, especially when follow-up cessation rates are considered (Bonser et al., 1990; Houts et al., 1994). A review conducted by Houts et al. (1994) found no reliable difference between basic urine alarm treatment and urine alarm treatments that utilised additional components. Adjusted means of 59% cessation of nocturnal enuresis was found for the basic urine alarm and 64% cessation for the urine alarm with additional components. These figures changed to 43% and 45% cessation at follow-up respectively. However, it has also been reported that adding some components to the urine alarm improves results (Bonser et al., 1990). When looking at relapse rates, for the basic alarm, these are between 35 and 41% compared to between 15 and 25% for multi-component treatment packages (Houts, 1991). More specifically, when arousal training, which involves positive reinforcement for appropriate toileting behaviour, is used with the urine alarm, the reported success rate is 98%

and 73% at a 2.5-year follow-up. When over-learning is added, relapse rates are reportedly reduced to 10-12%. However, RCT did not prevent relapse (Butler, 1998).

***Dry Bed Training.*** DBT has reportedly high success rates with low dropout rates (Butler, 1998, 2004). However, the research that compares DBT with basic urine alarm treatment is conflicting. Some researchers claim that there is no difference between relapse rates and the urine alarm is responsible for most of the results achieved by DBT. If the urine alarm was to be removed from this treatment package, its efficacy would be reduced (Brown et al., 2011; Butler, 1998). Other researchers claim that DBT is more effective than the basic urine alarm treatment (Bischof & Benson, 2004; Brown et al., 2011). Success rates of 85% (Christophersen & Vanscoyoc, 2013) and response rates of 100% (Bonser et al., 1990) have been reported on DBT. Reports on relapse rates are also conflicting with some researchers stating that there is no difference in relapse between DBT and basic urine alarm treatment with a 40% relapse rate (Bonser et al., 1990; Brown et al., 2011; Butler, 2004). Whereas other researchers have reported relapse rates between 7 and 12% (Christophersen & Vanscoyoc, 2013).

***Full Spectrum Training.*** There is limited research on Full Spectrum Training. It has been reported that the urine alarm is the most effective component of this treatment package (Butler, 1998). The average success rate for Full Spectrum Training with a criterion of 14 consecutive dry nights has been found to be approximately 79% with a 40% relapse rate (Brown et al., 2011).

All success rates and relapse rates from the urine alarm treatment, urine alarm treatment packages, DBT and Full Spectrum Training are summarised in Table 4.

Table 4

*Summary of Success and Relapse Rates for all Urine Alarm Treatments*

Study	Success Rate				Relapse Rate			
	UA	UA+	DBT	FS	UA	UA+	DBT	FS
Brown et al. (2011)	77.9%			79.0%	15.0-30.0%		40.0%	40.0%
Christophersen and Vanscoyoc (2013)	75.0%		85.0%		46.0%		7.0-12.0%	
Bischof and Benson (2004)	60.0-80.0%							
Bonser et al. (1990)	75.0%				40.0%			
Houts (1991)	77.0%					15-25%		
Butler (1998)					15.0-30.0%			
Butler (2004)					15.0-30.0%			
Meltzer and Crabtree (2015)					45.0%			
Houts et al. (1994)	59.0%	64.0%						

*Note.* UA = urine alarm; UA+ = urine alarm treatment packages; DBT = Dry Bed Training; FS = Full Spectrum Training

## Systematic Review

The purpose of this systematic review is to describe what research is available on urine alarm treatments in older children and adults. In addition, this review will aim to gain an understanding of the efficacy of urine alarm treatments for treating nocturnal enuresis in this age group. Research on urine alarm treatments with samples that include age groups 13 years and older are examined and are separated into urine alarm treatment efficacy, DBT efficacy and the efficacy of DBT compared to standard urine alarm treatment. Most studies on urine alarm treatments are not focused on older children specifically with only some

samples including people above 13 years of age (Bollard, 1982; Bollard & Nettelbeck, 1981; Butler et al., 1988). There is literature on urine alarm treatments in older age groups, however, these studies also include daytime incontinence and populations with neurological disabilities such as Autism Spectrum Disorder. As the current study was on nocturnal enuresis in a neurotypical group of older children, this systematic review will focus on the efficacy of the urine alarm treatment in this population.

**Search process.** A systematic review was conducted to compile any research on urine alarm treatments with older age groups. Searches were conducted using PsycINFO, PsycARTICLES, Educational Resources Information Centre (ERIC) and Google Scholar databases. Searches were limited to include articles on children over 13 years of age, written in the English language, that were empirical studies and peer-reviewed articles from databases accessible through the University of Canterbury Library. Furthermore, studies that included diurnal wetting, faecal incontinence or were not on neurotypical samples were excluded from this review. Reference lists from the acquired articles were examined to determine whether any additional articles were relevant to this review that were not found in the searches.

Searches were conducted on the databases mentioned using diagnostic terms (“nocturnal enuresis”, “bedwetting”, “enuresis”, “urinary incontinence”) and keywords relating to urine alarm treatments (“urine alarm”, “bed alarm”, “bell and pad”, “dry bed training”).

Results were flagged for further inspection if they described nocturnal enuresis as the condition; included any form of urine alarm treatment such as standard or DBT; were conducted with a neurotypical sample; some of the sample was over 13 years of age. A total of six articles from the searches were flagged that met the inclusion criteria. From further examination, one article was removed as it did not meet the age criterion. The study had two

treatment groups, one used the urine alarm, the other used desmopressin. Although the age group for the study overall met the age criterion, the urine alarm treatment group had a sample aged between 7 and 13 years which did not meet the inclusion criteria (Bath et al., 1996). A summary of the articles included in this review is presented in Table 5.

Table 5

*Summary of Studies Included in the Systematic Review*

Article	Sample	Design	Intervention	Dry Criterion	Success Rate UA	Success Rate DBT	Success Rate Control	Follow-up Relapse UA	Follow-up Relapse DBT
Bollard & Nettlebeck, 1981									
Study One	45 aged 5-14	Randomised control trial	Urine alarm and control comparison	14 dry nights	70%	n/a	0%	12mth 42.9%	n/a
Study Two	120 aged 4-15	Randomised control trial	Urine alarm and DBT comparison	14 dry nights	80%	100%	10%	12mth 37.5%	12mth 25.0%
Bollard, 1982	95 aged 5-15	Follow-up design	Urine alarm and DBT relapse comparison	14 dry nights	90%	100%	n/a	3mth 19.4% 6mth 22.6% 12mth 34.5% 24mth 41.1%	3mth 10.2% 6mth 22.4% 12mth 25.9% 24mth 39.2%
Butler et al., 1988	74 aged 6-14	Alternate allocation design	Urine alarm and DBT comparison	14 dry nights	70%	70%	n/a	n/a	n/a
van Son, Mulder, & Van Londen, 1990	9 aged 22-34	Pre/post follow-up design	DBT efficacy in adults	4 dry weeks	n/a	100%	n/a	n/a	3mth 33.3%
van Son et al., 1995	9 aged 21-34	Pre/post follow-up design	DBT efficacy in adults	4 dry weeks	n/a	100%	n/a	n/a	3yr 44.4% 5yr 22.2% 6yr 11.1%

*Note.* UA = urine alarm; DBT = Dry Bed Training; mth = month; yr = years

From the final five articles included in this review, two compared DBT and standard urine alarm treatment and two examined the efficacy of DBT in adults. The fifth article reported on two studies which have been reported on separately in this review, making six studies in total. One study compared two variants of the standard urine alarm with differing amounts of participant supervision throughout treatment and the other study compared variations of DBT with the standard urine alarm treatment (Bollard & Nettelbeck, 1981). The articles by Bollard (1982) and van Son, Van Heesch, Mulder, and Van Londen (1995) were separate follow-up studies from the original studies by Bollard and Nettelbeck (1981) and van Son, Mulder, and Van Londen (1990). All of which are included in this review.

**Urine alarm efficacy.** Study One from the Bollard and Nettelbeck (1981) study found that overall, the urine alarm was an effective form of treatment for nocturnal enuresis in children aged 5-14 years with a success rate of 70% compared to a 0% success rate for the control group. These findings are reported in Table 5. The study further investigated whether the amount of supervision received with the standard urine alarm treatment could affect treatment outcomes. This was determined by one group having no supervision and the other group having weekly contact with the researcher. This appeared to affect treatment dropout for the groups as three participants withdrew from the group with no supervision compared to none from the group with supervision. When those who dropped out were included in analyses, there was a significant difference between supervision and no supervision with regards to the number of wet nights. However, the difference in treatment length was not significant. No significant differences were found for treatment length or number of wet nights between supervision and no supervision when data from those who withdrew was removed. These findings show that supervision could have some effect on treatment outcomes, however, more research is needed to further understand the extent of this.



**Dry Bed Training efficacy.** The study from van Son et al. (1990) and the follow-up study from van Son et al. (1995) examined the efficacy of DBT in adults. DBT can be considered an effective treatment for nocturnal enuresis in adults. The researchers were able to determine that DBT demonstrated strong efficacy with a 100% success rate. This is a particularly strong finding as this study adopted a very strict dry criterion of 4 consecutive weeks. The other studies in this review used a 14-night dry criterion which is more common in the literature as a whole on urine alarm treatments. At follow-up, the relapse rate was a maximum of 44.4% at three years decreasing to 11.1% at six years after participants who relapsed received further treatment. The initial relapse rate at three months is slightly above what has been reported in other literature with most relapse rates at 7-40% (Brown et al., 2011; Christophersen & Vanscoyoc, 2013). However, the relapse rates at the other points of follow-up fall within a common range of what is reported for DBT. These findings are summarised in Table 5.

**Urine alarm and Dry Bed Training comparison.** There are mixed results on urine alarm and DBT comparisons. Study Two from Bollard and Nettelbeck (1981) found a significant difference between the standard urine alarm and DBT. DBT outperformed the standard urine alarm treatment when considering the number of wet nights and the number of days participants took to reach dry criterion. It took participants a mean of 35 days for DBT and 63 days for the standard alarm treatment to reach dry criterion, with a mean of 13 wet nights for those receiving DBT and 26 for those receiving the standard alarm treatment. The success rates for DBT, standard alarm treatment and the control group are reported in Table 5. The follow-up study determined that a difference was not found when examining relapse rates. From follow-ups at 3, 6, 12 and 24 months, there was no difference between DBT and the standard urine alarm treatment (Bollard, 1982). Butler et al. (1988) further found no significant difference between the two treatment methods with both DBT and the standard

urine alarm treatment achieving a 70% success rate. In addition, no differences were found between the time taken to reach dry criterion or the number of wet nights throughout treatment. It is important to note, that whilst no studies reported a difference in relapse rates between DBT and the standard urine alarm treatment, DBT does not typically use over-learning. Over-learning, when utilised, has demonstrated that relapse rates can be reduced to 10-12% (Brown et al., 2011; Butler, 1998, 2004).

Overall, the research on urine alarm treatments has indicated that this form of treatment is likely to be effective for nocturnal enuresis in adolescents and adults. However, more research is needed to determine whether there is a difference between DBT and the standard urine alarm treatment. In addition, the studies included in this review, excluding the van Son et al. (1990) and van Son et al. (1995) studies on adults, still included younger age groups. Furthermore, no studies identified adolescent participants in analyses so treatment efficacy cannot be determined for this age group specifically. More targeted research on urine alarm treatments and treatment programmes tailored to older age groups, particularly adolescents older than 13, is needed to determine the treatment efficacy. A summary of all of the studies included in this systematic review can be found in Table 5. The two studies by Bollard and Nettelbeck (1981) and Bollard (1982) are strong as they are a randomised control design and a follow-up to the randomised control design, and they included a control group. The study by Butler et al. (1988) has a slightly reduced quality as they used alternate allocation for the groups instead of random allocation and they did not include a control group. It is important to note that when comparing these studies, the two studies that investigated DBT in adults had a longer dry criterion than the other studies (van Son et al., 1990; van Son et al., 1995).

## **Aims and Rationale**

This review has outlined the range of treatments available for nocturnal enuresis. The most effective treatment and the main focus of the review were the urine alarm treatments. Urine alarm treatments have many different versions, all of which have produced promising results. Some researchers argue that the multi-component programme, DBT, may produce improved treatment outcomes to other urine alarm treatments (Bollard & Nettelbeck, 1981; Christophersen & Vanscoyoc, 2013). DBT typically incorporates several additional components to the urine alarm including night waking schedules, RCT, positive practice, cleanliness training, increased fluid intake and positive reinforcement (Bischof & Benson, 2004; Brown et al., 2011). This treatment programme has produced high success rates in previous research (Bollard & Nettelbeck, 1981; Christophersen & Vanscoyoc, 2013), although the research is conflicting on whether these results are superior to standard urine alarm treatments. More research is needed on multi-component urine alarm treatments to further determine whether they are an effective form of treatment, particularly for older age groups. Very little research focuses on the efficacy of urine alarm treatments per se in adolescents. Some studies include participants from this age group; however, they are often combined with younger children. This is surprising considering nocturnal enuresis is usually more severe and the need for intervention is greater in this age group (Yeung et al., 2006). From the systematic review reported above, only four studies partially included the adolescent age range with no studies focusing on older children specifically. Furthermore, there are no reports of a urine alarm treatment being altered to specifically tailor to older children. This is necessary as this age group will have different needs developmentally compared to younger children. Treatment programmes should allow for more independence for older children throughout treatment and resources may need to be altered to appeal to this age group. No research was found in the current review of the literature that utilised and

analysed the impact of a motivational youth psychoeducation session designed to educate and motivate participants on nocturnal enuresis and their treatment programme. Research with this additional component would be interesting as increased motivation and self-efficacy have been associated with an increased likelihood for behaviour change and treatment success (Bandura, 1977; Butler, 1998; Nevéus, 2011). Furthermore, there is little research that assesses the wider effects that treatment of nocturnal enuresis may have on older children and their families such as their self-efficacy, behavioural and emotional problems, and parenting styles.

The current study sought to address many of the gaps in the literature. More specifically, the study aimed to examine the efficacy of a multi-component, urine alarm-based, behavioural intervention programme in a sample of older children and adolescents diagnosed with nocturnal enuresis. The multi-component programme utilised in the current study included components such as the urine alarm, positive reinforcement, RCT, cleanliness training and over-learning. In addition, the added impact of a motivational youth psychoeducation session on treatment performance was explored. The youth session was specifically designed as part of the treatment package to educate the young person on enuresis, explain the treatment programme and to increase motivation. The current study also measured changes in emotional and behavioural problems, self-efficacy, and parenting styles for the families who received treatment to explore what greater affects treatment for nocturnal enuresis may have.

The current study aimed to answer the following research questions:

1. Can the multi-component, urine alarm-based, behavioural intervention:

The Bedwetting Programme eliminate nocturnal enuresis to the criterion of 14 consecutive dry nights in young people aged 11 to 15 years?

2. Do wet nights reduce more rapidly once a motivational youth psychoeducation session has been implemented?

## **Chapter 3**

### **Methods**

#### **Context for the Research**

The Pukemanu Dovedale Clinic (PDC) is a clinic that is run at the University of Canterbury by registered psychologists and Child and Family Psychology placement students. The PDC run the multi-component, urine alarm-based behavioural intervention programme utilised in the current study called The Bedwetting Programme. This programme was originally designed for children from 8 years of age and was modified for this study by the PDC to specifically cater for older children. Resources were altered to appeal to older children and tasks usually heavily assisted by parents, were encouraged to be completed independently if possible, by the youth. This included waking without help from parents when required to for the treatment programme, taking full responsibility for any cleaning as a result of bedwetting and reporting progress in the recording sheets. The parents' role was to assist the youth when needed and to encourage the young person to complete tasks as independently as possible. Families who have been experiencing bedwetting can approach the clinic to go through the clinic's screening process. This determines whether The Bedwetting Programme is a good fit for the family. The programme uses the urine alarm as its main component for treatment. The current study was based on this programme with some minor changes that were made for research purposes. Additional questionnaires were administered, and the order of some treatment components was manipulated.

#### **Participants**

The participants were nine adolescents ranging from 11 to 15 years old. This included seven males and two females, and their caregiver(s). All participation in the study was voluntary. The sample demographics are displayed in Table 6. To protect the identity of

participants, pseudonyms that the young people chose for themselves have been used in place of real names.

Table 6

*Sample Demographics*

Adolescent's Name	Age at Screening	Gender	Ethnicity
Ben	15	m	New Zealand European
Chris	12	m	New Zealand European
Geoff	11	m	New Zealand European
Pies	11	m	New Zealand European
Tactics	12	f	Māori
Bella	11	f	New Zealand European
Miracle	14	m	Māori
Jason	12	m	New Zealand European
Lebron	14	m	New Zealand European

*Note.* m = male; f = female

**Recruitment and Screening.** Recruitment and screening were done by the PDC as part of normal practice. Recruitment began in May 2018. Local counsellors from secondary schools, urologists and paediatricians, medical practices, and a medial organisation were contacted first by phone, then by email. Counsellors were asked to send out a notice to the parents of their school (see Appendix A for a copy of this notice). Urologists, paediatricians and medical practices were emailed information about The Bedwetting Programme and were asked to refer any patients they thought would benefit from the programme (see Appendix B for a copy of this email). Two local radio stations with a community notice service agreed to broadcast details of the project (see Appendix C for this notice).

Potential participants contacted the PDC and screening phone calls and interviews were arranged. Screening interviews were conducted by a registered psychologist and two, Child and Family Psychology students on placement at the PDC. In the screening phone calls

and interviews, it was determined whether the participants met the entry criteria for The Bedwetting Programme. The study used the same entry criteria that had been established by The Bedwetting Programme and one age criterion specific to the study. Once it was established whether participants met the entry criteria, they were invited to participate in the study.

***Inclusion criteria.*** The inclusion criteria were:

1. The young person met the DSM 5 criteria for nocturnal enuresis or nocturnal enuresis was causing significant distress.
2. The young person was between 11 and 18 years old at the start of treatment (this was a criterion for the study group only).
3. The caregiver(s) and young person were motivated to undergo treatment from The Bedwetting Programme.

***Exclusion criteria.*** The Exclusion criteria were:

1. The young person had daytime wetting.
2. There was a medical explanation for the nocturnal enuresis.
3. The young person had a well-being problem that would hinder their ability to complete The Bedwetting Programme. No participants were excluded due to this criterion.
4. Any parental well-being problem or family dynamic that was likely to interfere with treatment or make it unwise to proceed. No participants were excluded due to this criterion.

In addition to the entry criteria, participants had to comply with The Bedwetting Programme throughout the duration of their treatment. For example, if participants chose not to attend sessions at the clinic, they were removed from the treatment programme and the study.



## Experimental Design

The research design adopted for this study was an AB design. A multiple baseline design was not possible for this study as the educational parent session was fixed and the motivational youth psychoeducation sessions were fixed to two weeks. This limited how much the researchers could manipulate the timing of these components. Two groups were randomly assigned. Group One received the motivational youth psychoeducation session before the urine alarm treatment started, whereas Group Two started the urine alarm treatment before their motivational youth psychoeducation session. The implementation of the urine alarm was then staggered in both of these groups. The two-week window for the motivational youth psychoeducation sessions was utilised in Group Two so that participants could start their urine alarm treatment before their youth session whilst still utilising the staggered implementation of the urine alarm. Figure 1 shows a summary of this design. The two groups were used to explore whether the motivational youth psychoeducation session could have an additional impact on the efficacy of the treatment. Staggered implementation of the urine alarm was used to determine whether it was the urine alarm that caused the change in nocturnal enuresis.

All participants completed a 14-day baseline that occurred after participants had contacted the PDC. Potential participants were asked to begin recording dry and wet nights when they contacted the PDC. The independent variables in this study were The Bedwetting Programme urine alarm treatment and the order of the programme components. The dependent variable was the absence or presence of the youths' nocturnal enuresis, defined by 14 consecutive dry nights.

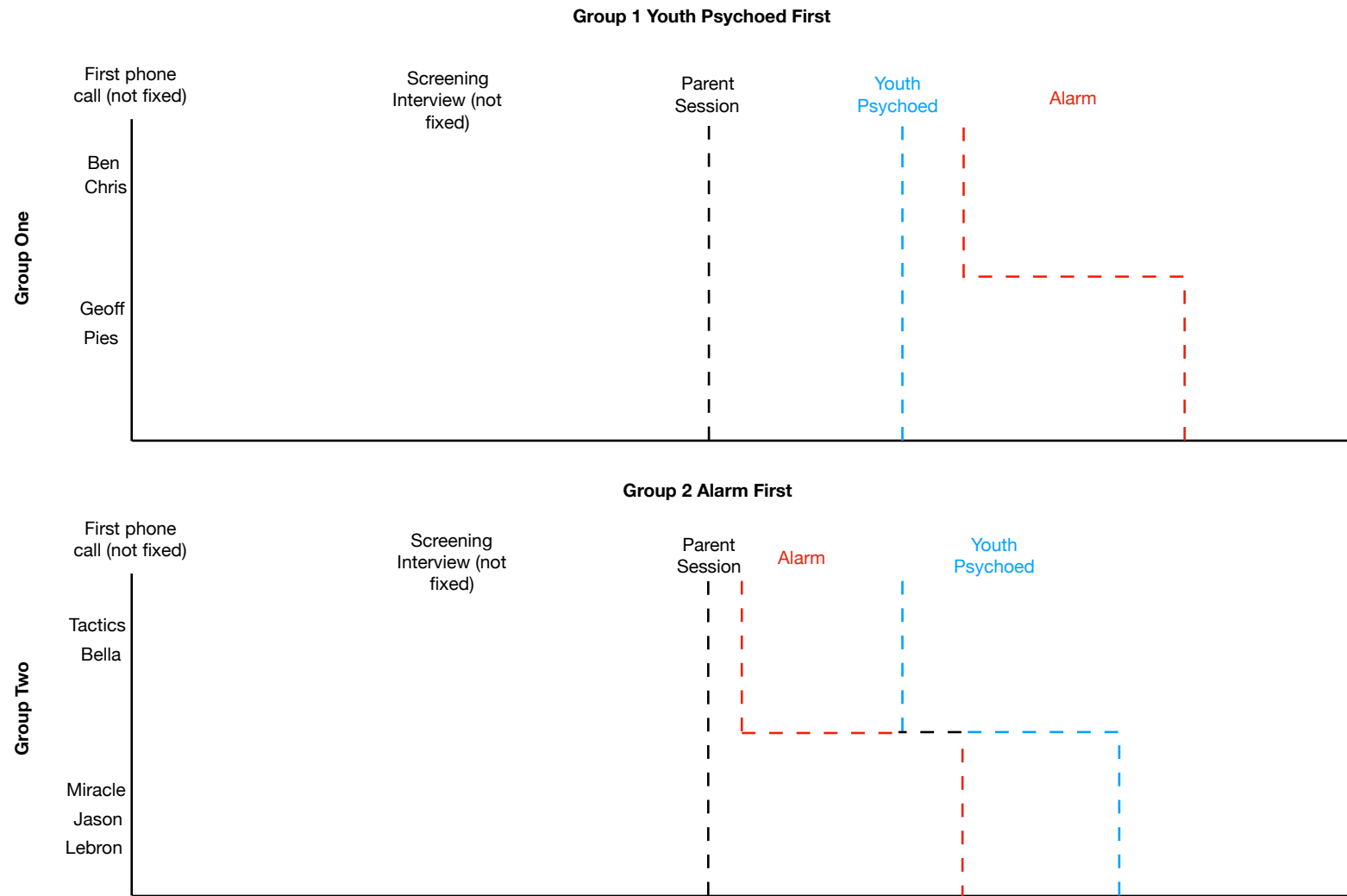


Figure 1. Study design summary.

Note. Youth Psychoed = motivational youth psychoeducation session.

## **Ethical Approval**

This study was granted ethical approval by the University of Canterbury Human Ethics Committee on 2<sup>nd</sup> July 2018, as shown in the approval letter in Appendix D. Following ethical approval, potential participants were informed about the study and invited to participate during the screening process from the PDC. Information Sheets, Consent and Assent forms can be found in Appendices E, F, G and H.

## **Materials and Apparatus**

Recording sheets and information sheets were given to participants at the screening interviews. All participants used the Ramsey Coote PB model rechargeable mat alarms. These alarms had two parts: the rechargeable alarm unit and the rubber mat that was placed on the bed. The alarm was designed to sound when the mat came in contact with urine. All mats were tested with at least two alarm units and all alarm units were tested with at least two mats to ensure all of the equipment was working before being leased to participants. The families paid deposits when they were issued the alarms which were either refunded or donated by the family to the clinic when the alarms were returned upon completion of the treatment. This was the parents' choice. The alarms were picked up from the clinic by the participants who received them first from Group 2 at the educational parent session, this included Tactics and Bella, and the first to receive them from Group 1 at the motivational youth psychoeducation session, this included Ben and Chris. The alarms were delivered to the rest of the participants' homes, this included Geoff, Pies, Miracle, Jason and Lebron.

## **Setting**

There are two settings in the current study, as some components were carried out at the PDC and other components were carried out at the participants' homes. The screening interviews, completion of pre-treatment questionnaires, the educational parent session and the motivational youth psychoeducation session all took place at the PDC whereas the baseline

data recording, FBC measurement, urine alarm treatment, follow-up and completion of follow-up questionnaires all took place at home for each of the participants.

## **Measures**

**Questionnaires.** Both parents and young people completed the Child Behaviour Checklist (CBCL), Parenting Scale-Adolescent (PSA) and Self-Efficacy Scale (SES) at baseline during the screening interviews and at follow-up. Some of these questionnaires were standard for the PDC Bedwetting Programme, whereas others were introduced as part of the study.

*Measures used by the standard programme.* All of the parents were asked to complete the Parent Report CBCL and all youth were asked to complete the Youth Self-Report CBCL (Achenbach & Rescorla, 2001) as part of the PDC standard Bedwetting Programme. The CBCL was used in the current study to report on behavioural and emotional problems of the sample and how this changed across pre- and post-intervention. More specifically, the CBCL assesses child activity, social and school-based competencies under the Competence Scale, and behaviour problems which are categorised under internalising and externalising syndromes under the Syndrome Scale. Scores are calculated for each subscale in the CBCL by providing a total score of the items included in that subscale. For each of the Competency Subscales, low scores are in the clinical and borderline ranges and high scores are in the normal range. For each of the Syndrome Subscales, high scores are in the clinical and borderline ranges whereas low scores are in the normal range. Scores for the Total Competence, Internalising, Externalising and Total Syndrome are made up of the other subscales and are calculated using T scores which can be in the normal, borderline or clinical ranges (Achenbach & Rescorla, 2001). Findings from the CBCL were used to provide data on the sample as a whole to determine whether any behavioural or emotional characteristics

presented in the clinical or borderline range for participants and whether this changed at follow-up.

***Measures employed for the study.*** All of the parents from the families who agreed to participate in the study were asked to complete the PSA (Irvine, Biglan, Smolkowski, & Ary, 1999) and the SES Parent version, and all youth were asked to complete the SES Teen version for the study.

The PSA is based on the Arnold, O'Leary, Wolff, and Acker (1993) Parenting Scale and assesses parenting styles in parents of adolescents. These scales are scored on a 7-point Likert scale with high scores corresponding to maladaptive and low scores corresponding to adaptive parenting methods. The items from the PSA are loaded on two factors, the Laxness factor and the Over-Reactivity factor. The mean scores from the items were calculated to give scores for each factor and the total (Irvine et al., 1999). This scale was used to provide data on the sample's parenting styles as a whole and whether they changed after treatment. A copy of this questionnaire can be found in Appendix I.

Both the Teen and Parent SES were put together for this study by the researchers based on the General Self-Efficacy Scale by Sherer et al. (1982) which was constructed using Bandura's (1977) Self-Efficacy Theory. Bandura outlined the importance of self-efficacy when changing behaviour as it determines whether people are persistent in the face of adversity, whether they decide to perform the behaviour and how much effort they will put into changing the behaviour. Bandura also states that therapeutic changes in behaviour can result in changes in self-efficacy. Two versions of the Teen and Parent SES were created for the study, one for pre-intervention and one for post-intervention. For the pre-intervention SES, the items were based on general confidence about developing the skills to become dry at night and other items specifically targeted certain aspects of The Bedwetting Programme such as using the alarm and increasing fluid intake. For example, "I am confident that I will

be able to train my bladder muscle to hold my urine at night” or “I will be able to help my teen learn to hold their urine for longer and longer periods of time”, and “I am confident that I will be able to wake up and turn off the alarm if it goes off” or “I will be able to ensure my teen awakens if the alarm goes off any night during the programme”. For the post-intervention version of the SES, items specifically targeting the treatment were removed as they no longer applied, and the general items were used and reworded so that they applied to post-intervention. For example, “I am confident that my bladder muscle will be able to hold my urine at night”. Each item was scored on a 5-point Likert scale on all versions of the SES from “Strongly disagree” to “Strongly agree”. Higher scores corresponded to more confidence with a neutral value of three. For this study, the SES was used to assess participants’ self-efficacy with regards to The Bedwetting Programme and becoming dry or assisting their teenager to become dry and how this may have changed after treatment. A copy of the pre- and post-intervention SES can be found in Appendix J and Appendix K respectively.

**Nocturnal Enuresis.** Participants were given baseline and treatment phase recording sheets to record wet and dry nights. The baseline sheet included dates, whether the teenager was wet or dry in the morning, the number of times they got out of bed during the night and any additional comments for each night (Appendix L). The treatment phase recording sheet was more detailed and included dates, whether the teenager was wet or dry that night, times the alarm sounded, whether they woke to the alarm, the size of the wet patch (small, medium, large), whether they woke to use the toilet without the alarm and any additional comments (Appendix M). These measures were part of the PDC standard Bedwetting Programme. The data from these recording sheets were used in the study to measure nocturnal enuresis. This was measured by the number of wet nights, whether the 14-night dry criterion was achieved, and the number of nights taken to reach dry criterion.

## Procedures

### Baseline Phase.

**Standard programme.** Participants were asked to record wet and dry nights after they first contacted the PDC before the screening interviews. The baseline period continued for 14 days. Before the educational parent session, each family attended a screening interview at the PDC to determine whether The Bedwetting Programme was the right fit for them. At the end of the interview, the CBCL (parent and youth self-report) was completed. This was completed with the research student so that all questionnaires could be completed together. All families completing The Bedwetting Programme were asked to measure their FBC before the intervention began. For this test, participants were instructed to drink as much water as they could, hold their urine for as long as they could, urinate into a container and measure the urine (Kanbur et al., 2011). The measurements were used to determine the participants' FBC. This information was used to assist in determining whether RCT should be used if progress in the treatment was slow for a family.

**Study.** At the screening interviews, if the family expressed interest in participating in the study, they had a session with the research student. This was where they chose their pseudonyms, were assigned to a group and completed the CBCL, PSA and SES (Parent and Teen versions). The data collected for the 14-day baseline was used in the study. Participants were told that they could withdraw from the study at any time and that this would not affect their treatment in The Bedwetting Programme.

**Intervention Phase.** After the baseline phase and the screening interviews, all parents attended an educational session at the clinic. After the educational parent session, all participants attended the motivational youth psychoeducation session and started the urine alarm treatment, the order of which was manipulated for the study. Group 1 attended a motivational youth psychoeducation session first, followed by beginning the urine alarm

treatment. Group 2 first begun the urine alarm treatment, followed by attending the motivational youth psychoeducation session. Participants then continued with the urine alarm treatment. Once participants had been dry for at least 14 nights in a row, they started over-learning and then the urine alarm began to be phased out. A summary of the order of components for the groups is displayed in Figure 2.

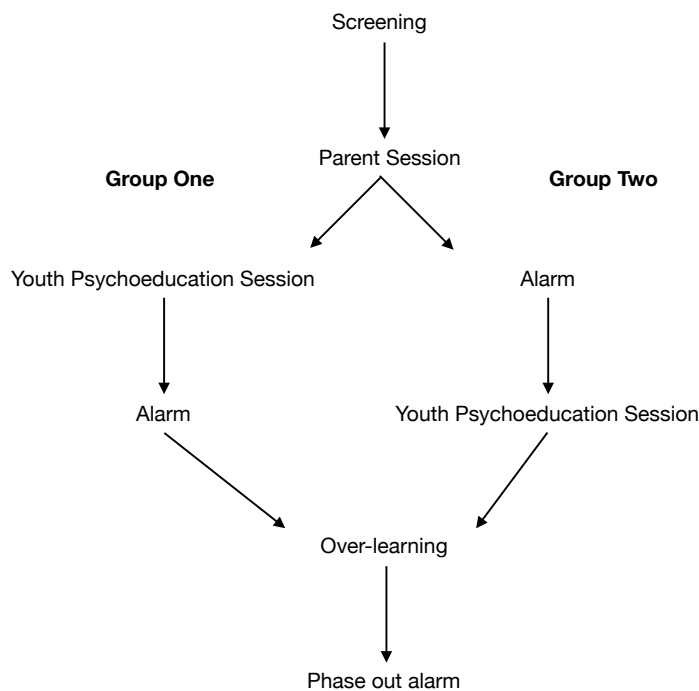


Figure 2. Group summary.

### ***Standard programme.***

*Increased fluid intake.* Teenagers were encouraged to increase the amount of water they drank each day throughout The Bedwetting Programme. They were provided fluid intake recording sheets and reward sheets so that their fluid intake could be monitored, and extra motivation could be provided (see Appendix N). A fluid intake information sheet was also provided which explained the benefits of drinking more water. The fluid intake information sheet can be found in Appendix O.

*Parent Session.* After the screening interviews were completed, the parents from all of the families who had met screening criteria attended a session at the clinic. The session was



conducted by a registered psychologist and the Child and Family Psychology placement students. It included an in-depth description of the components of The Bedwetting Programme and what aspects needed to be completed before starting the treatment such as a medical check and two weeks of baseline data. Explanations on how the bladder works, information on nocturnal enuresis and a demonstration on how to use the urine alarm were also covered in the session. Parents had opportunities to ask questions throughout the session.

*Youth Psychoeducation Session.* Families had individual sessions with one of the Child and Family Psychology placement students. A registered psychologist was also present at some of these sessions with at least one parent and the young person. Participants were educated on how the bladder works and the ‘training the brain’ concept was introduced which meant being aware when the bladder is full at night and training the bladder muscle to hold on all night. The Bedwetting Programme was then explained to the young person and motivation was encouraged. The young person was made aware that the programme would involve hard work from them. Their responsibilities in the programme were outlined to them, as the programme is designed for the youth to carry out tasks as independently as possible. In this programme specifically tailored to youth, young people were encouraged to take on more responsibility than is likely to be possible in a child programme such as washing their sheets independently and having the option to control their waking throughout treatment. Next, a reward agreement was established between the young person, the Child and Family Psychology placement student and the parent. The reward agreement was explained and written on paper with a copy for the family and a copy for the PDC. All participants were rewarded after 1, 3, 5, 10, and 14 consecutive dry nights with their agreed reward from the reward contract. The young person also received a letter at 3 dry nights and a prize at 14 dry nights from the Child and Family Psychology placement student.

Also, in this session, the youths were encouraged and to think about the reasons why staying dry was important to them each night before bed. The “beating the buzzer” concept was also introduced to motivate participants. “Beating the buzzer” meant that the participants needed to notice the need to urinate before they began to wet and set the alarm off, therefore “beating the buzzer”. Participants were made aware that they would be supported through their journey to becoming dry with frequent phone calls from the Child and Family Psychology placement student. Next, the placement student demonstrated the alarm to the family if needed. The session concluded with feedback on the CBCL from the placement student.

*First night with urine alarm.* A night waking schedule of waking every hour was used by all participants for the first night of treatment. The alarm was placed on the bed, and the parents were instructed to wake their young person every hour. For each waking, the young person drank some water, went to the toilet and then went back to bed. Families were told that the young person could wake themselves if they believed they could do so. This was specific to the tailored youth programme as children are typically woken by their parents in child programmes. This process was only carried out for the first night of the urine alarm treatment.

*Urine alarm.* After the first night, the teenagers were only woken by the alarm or if they woke up naturally. Participants were given clear, step by step instructions that outlined what they needed to do each time the alarm went off. This included turning the alarm off, turning on a light, going to the toilet, putting any wet clothing or bedding out to be washed and replacing with clean alternatives, wiping down the alarm, resetting the alarm, and going back to sleep. Participants were encouraged to role-play this sequence when they were awake. In the morning the young person filled out their treatment phase recording sheet (Appendix M) and washed any clothes or sheets that were wet. Parents were told to make

sure their child woke when the alarm went off and to support them throughout The Bedwetting Programme when needed. The tasks needed to be completed as independently as possible by the young person. Parents were advised to ignore bedwetting as much as they could and to offer their young person positive encouragement and institute the agreed rewards.

*Retention control training.* RCT was used by the PDC at the discretion of the Child and Family Psychology placement students. Families underwent RCT based on the family's progress and a low FBC. Some research has indicated that a low FBC is correlated to nocturnal enuresis and that increasing FBC through RCT can improve bedwetting (Brown et al., 2011). RCT involved increasing the young person's fluid intake and refraining from using the toilet for longer periods than usual. One family used RCT.

*Shaping.* Shaping was used by the PDC in cases where progress was slow, at the discretion of the Child and Family Psychology placement students. This involved altering the criteria for a dry night. For example, if the young person had a minor wet where the urine was contained in the underwear it was marked down as a dry night. When improvement was made with this new criterion, the criteria became stricter, working back to being completely dry to mark down a dry night. Shaping was used with one family.

*Night waking schedule.* Additional night waking schedules were used by the PDC when the Child and Family Psychology placement students determined them to be useful for a family making slow progress. Unlike the first night with the urine alarm, this involved waking the young person at a prearranged time to use the toilet, not every hour. An additional night waking schedule was used with one family.

*Over-learning.* Over-learning was carried out once the participants had achieved at least 14 consecutive nights dry. Over-learning involved encouraging the young person to consume large amounts of water before bed while continuing to use the urine alarm.

Occasionally this process resulted in a wet night; if this was the case, the over-learning period was continued until 14 consecutive dry nights were achieved.

*Phasing out the alarm.* Phasing out the alarm began once the participant met the criterion of 14 nights dry and had completed over-learning. This phase was planned to take two weeks to 1 month and typically started with removing the alarm for one to two nights per week. Phasing out continued until the alarm was eliminated. The Child and Family Psychology placement students determined the number of nights each week the alarm was to be removed for each participant. If wetting resumed for more than 4 nights when the alarm was being phased out, it was recommended that the participant repeat The Bedwetting Programme. If the wetting was less than this, a new goal was negotiated.

### ***Study.***

*Parent Session.* The Parent Session was not changed for the study and the timing of this was not manipulated. Although, an explanation of the study and how it would fit with the standard Bedwetting Programme was given by the research student at the end of the session.

*Youth Psychoeducation Session and urine alarm.* The Youth Psychoeducation Sessions and the urine alarm treatment, including the first night, were to be conducted as they typically would be for The Bedwetting Programme. As part of the study, when participants received these components was manipulated. Completion of questionnaires, random assignment of the groups and choosing the pseudonyms took place at the end of the Youth Psychoeducation Sessions with the research student. The first night with the urine alarm and the Youth Psychoeducation Sessions were randomly assigned to take place on a certain week on a day that best suited each family. Data on wet and dry nights were collected for the study while participants were using the urine alarm.

*Additional treatment components.* RCT, shaping and night waking schedules were used as they typically were in The Bedwetting Programme. Data was collected for the study

so that it could be marked when participants received these additional components throughout their treatment.

*Over-learning.* Over-learning was conducted as it typically would be for The Bedwetting Programme. Data was collected on wet and dry nights for the study until the end of over-learning.

### **Follow-up phase.**

*Standard programme.* The PDC conducted their follow-up independently from the study to establish whether the young people were continuing to stay dry.

*Study.* All participants who had reached their dry criterion were invited to take part in the follow-up phase for the study. The Follow-up phase for bedwetting data occurred 9 weeks after participants had completed the urine alarm treatment phase. The follow-up phase was 14 days long and participants used the same recording sheet that they used in baseline (see Appendix P). Participants completed the post-intervention questionnaires after they had completed the bedwetting follow-up. The CBCL Parent Report and Youth Self-Report (Achenbach & Rescorla, 2001), and the PSA (Irvine et al., 1999) were completed the same as they were pre-treatment and the post-intervention version of the SES was completed (see Appendix K). Families do not complete follow-up questionnaires as part of the standard Bedwetting Programme.

### **Data Analysis**

Quantitative methods were used to analyse the data from this study. Data from the questionnaires were summarised across participants and displayed in a table for each questionnaire. Mean, median, standard deviation, range and the number of participants in borderline and clinical ranges where this was available were used to summarise each questionnaire and their subscales. Data that was recorded on the number of wet nights across baseline, intervention, over-learning and follow-up phases were graphed. The Parent Session

and the Youth Psychoeducation Session, incidences of RCT, shaping and night waking schedules were marked on the graph.

## Chapter 4

### Results

#### Quality of the Data

One participant was withdrawn from the current study. Two other participants did not complete the over-learning phase with one of these participants also not completing the follow-up phase. Lebron was withdrawn from The Bedwetting Programme and the current study, due to the family's decision not to attend the required Youth Psychoeducation Session at the PDC. All data from this family was removed from the study. Jason's family decided not to participate in the over-learning phase of The Bedwetting Programme. This phase is therefore not included in Jason's plot (see Figure 3). Pies completed over-learning after data collection had finished so his data from this phase was not included. As data collection finished at the same time that Pies reached the dry criterion, he was also unable to participate in the follow-up phase for the study. All other participants completed all components of the programme within the study period.

There were minor omissions in data for some of the participants. Ben and Pies both missed one night from the baseline phase, Pies and Tactics missed one night from the treatment phase and Miracle missed two nights from the treatment phase. All other participants had no missing bedwetting data.

There were some missing data from the questionnaires completed for this study. Pies' family did not complete the pre-intervention PSA and Jason's family completed the PSA at the Youth Psychoeducation Session before their urine alarm treatment. All other participants completed the PSA at the screening interviews. Bella's family had two missing items from the post-intervention PSA Mother Report. All other participants had no missing questionnaire data.

Miracle started his urine alarm treatment late which meant that he started the alarm on the same day that he had his Youth Psychoeducation Session. He was in Group Two and therefore should have started the urine alarm treatment before the Youth Psychoeducation Session.

### Wet Nights

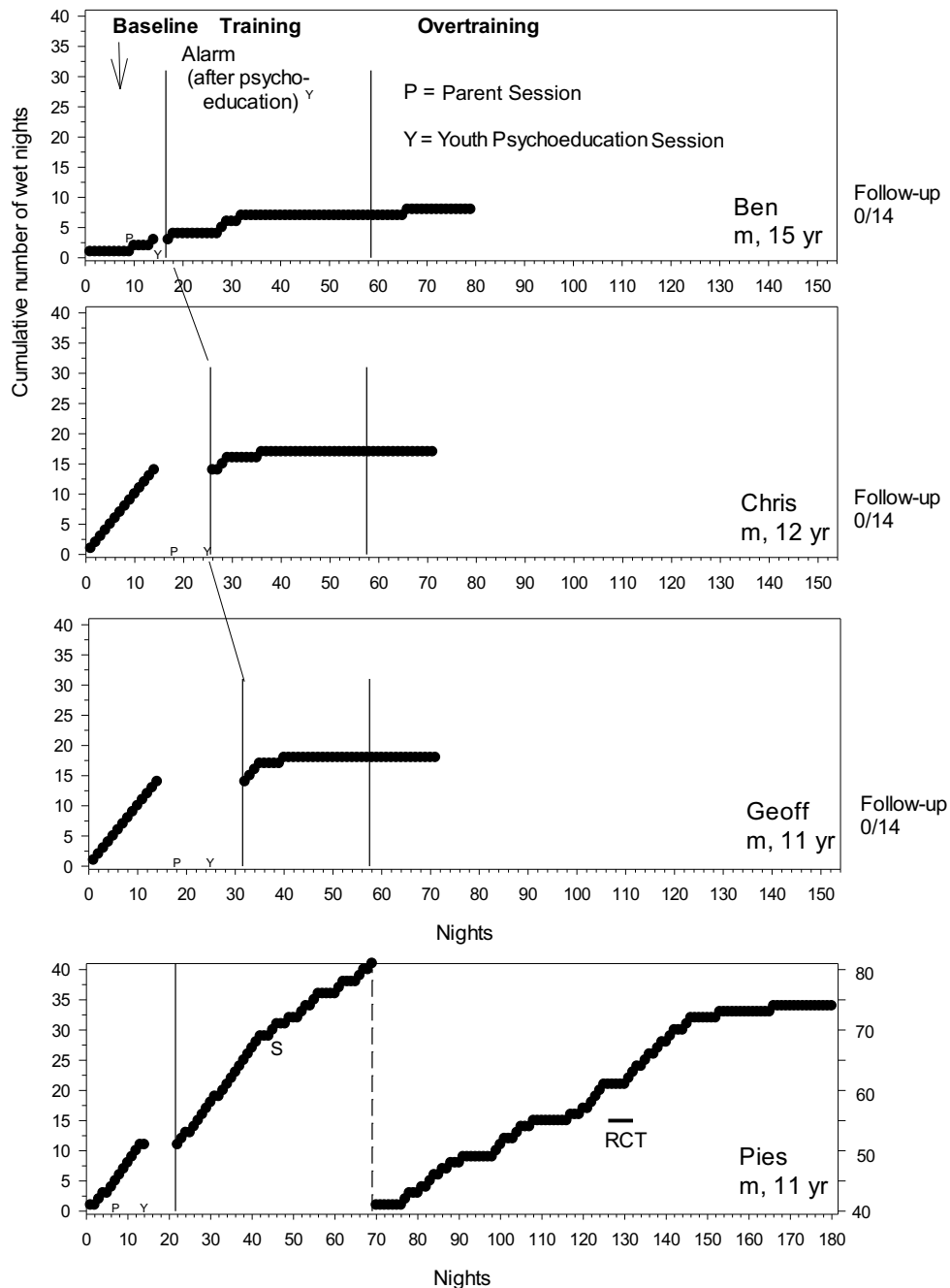


Figure 3. Number of cumulative wet nights throughout baseline, treatment and over-learning phases.

Note. P = Parent Session; Y = Youth Psychoeducation Session; S = shaping; RCT = retention control training; NWS = night waking schedule yr = years old; m = male; f = female.



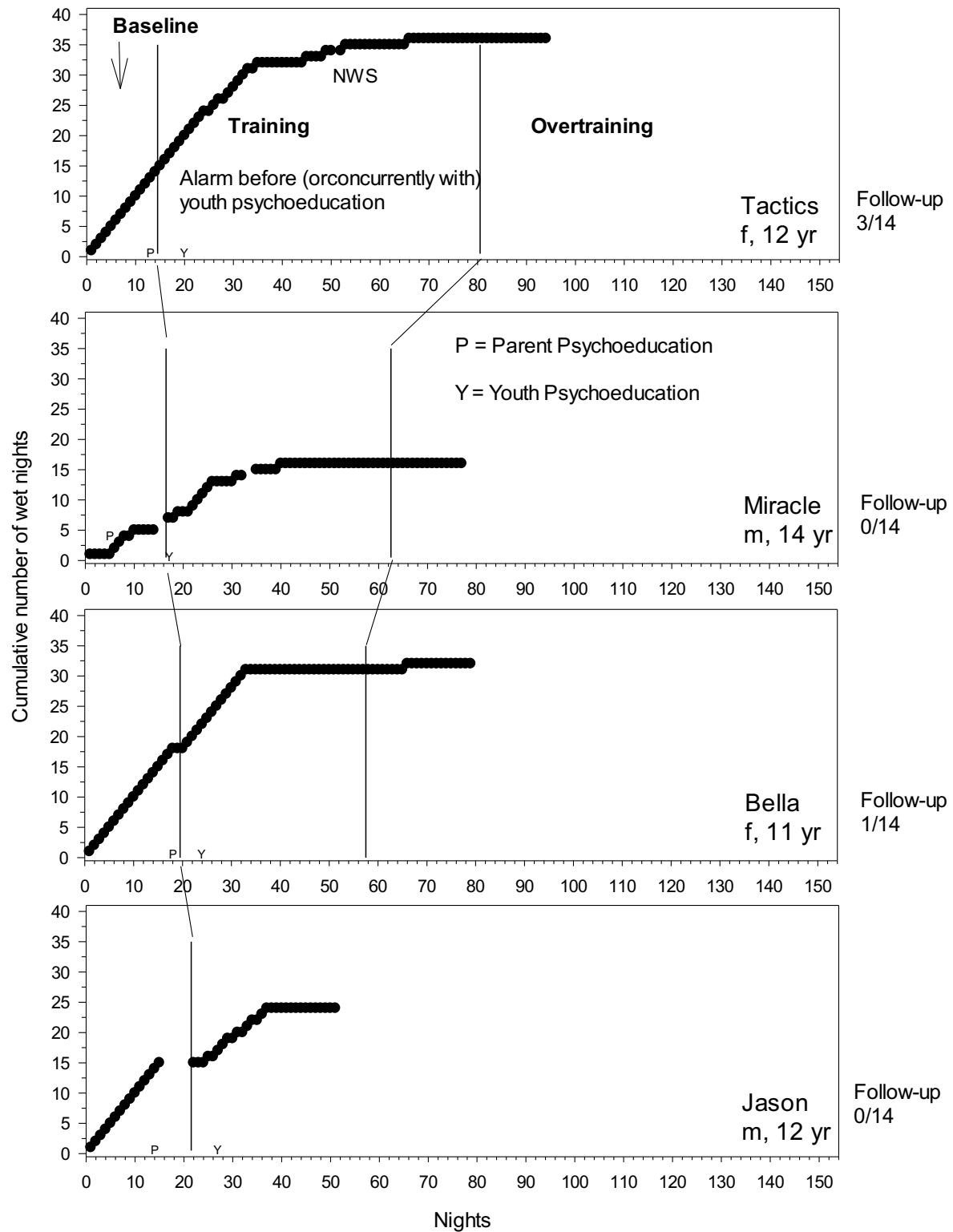


Figure 3. (continued).

Figure 3 shows the cumulative number of wet nights for each youth. Data on wet and dry nights were recorded by participants for 14 nights across baseline, and every night across treatment, and over-learning phases. This data is displayed in Figure 3 using a cumulative

design. Participants having wet nights every night are shown on the graph with a diagonal line with a gradient of one. When participants become dry, this line becomes flat to show no wet nights. The Parent Session and Youth Psychoeducation Session which all participants received have been displayed on the graph with a P and a Y respectively. The additional components outside of the basic Bedwetting Programme including shaping, night waking schedules and RCT have been marked on the graph to indicate the incidences in which they were utilised. The participants have been displayed in the two groups: Group One who had the Youth Psychoeducation Session first and Group Two who had the urine alarm first. It is important to note that as the treatment for Pies occurred over a longer period than the other participants, his data is presented on a different scale so this plot cannot be compared with other participants. The cumulation of wet nights was restarted in Pies' plot to adequately display the data. This is shown with the dashed line. The follow-up phase is shown for all of the participants who completed this phase next to each plot with the number of wet nights out of the total 14 nights.

All participants who took part in The Bedwetting Programme (excluding the family removed before their Youth Psychoeducation Session) achieved the dry criterion of 14 consecutive nights. All but one participant achieved dry criterion within 66 nights of using the urine alarm with a maximum of 22 wet nights throughout this phase. Participants in Group One achieved dry criterion between 23 and 30 nights with between three and four wet nights throughout their treatment with the urine alarm. Group Two achieved dry criterion between 29 and 66 nights with between nine and 22 wet nights throughout their treatment with the urine alarm. After receiving the Youth Psychoeducation Session, Group Two took between 24 and 61 nights to reach dry criterion with between 8 and 17 wet nights. In the over-learning phase, out of all of the participants who completed this phase, two participants had one wet night with the rest of the participants having no wet nights. From the follow-up

phase, most participants had no wet nights except for two participants (29%): one had three wet nights and the other had 1 wet night. All of these findings are displayed in Figure 3.

As shown in Figure 3, Ben had three wet nights in the 14-day baseline phase. Ben was in Group One and started the urine alarm treatment two nights after the Youth Psychoeducation Session. In the treatment phase, Ben had 4 wet nights and took 30 nights to meet the 14-night dry criterion. He did not receive any additional components. Ben had one wet night during the over-learning phase and no wet nights during follow-up.

Chris was wet every night for his 14-day baseline. He was in Group One and received the urine alarm treatment one night after the Youth Psychoeducation Session. Chris had three wet nights during the treatment phase and took 25 nights to reach the 14-night dry criterion. He did not receive any additional components. Chris had no wet nights during the over-learning or follow-up phases.

Geoff was also wet every night for his 14-day baseline. He was in Group One and received the urine alarm treatment seven nights after the Youth Psychoeducation Session. Geoff had four wet nights in the treatment phase and took 23 nights to achieve the 14-night dry criterion. He did not receive any additional components. Geoff had no wet nights for the over-learning or follow-up phases.

Pies had 11 wet nights during his 14-day baseline. He was in Group One and started the urine alarm treatment eight nights after the Youth Psychoeducation Session. Pies had 63 wet nights during the treatment phase and took 159 nights to reach the 14-night dry criterion. He used shaping on the 25<sup>th</sup> night of the urine alarm treatment which decreased wetting slightly down from wetting every night. Pies also used RCT from the 105<sup>th</sup> night of treatment until the 111<sup>th</sup> night which appears to have resulted in another dry period while it was used. Pies completed over-learning; however, this occurred after data collection for the study had finished. Subsequently, he was not able to complete the follow-up phase for the study.

Tactics was wet every night of her 14-day baseline. She was in Group Two and started the urine alarm treatment five nights before the Youth Psychoeducation Session. Tactics had 22 wet nights during the treatment phase with 17 of these after the Youth Psychoeducation Session. She took 66 nights to achieve the 14-night dry criterion and 61 nights after the Youth Psychoeducation Session. Tactics used a night waking schedule on the 41<sup>st</sup> night of treatment which reduced wetting to only one wet night after it was implemented. She had no wet nights during the over-learning phase and 3 wet nights during follow-up.

Miracle was wet five nights during his 14-day baseline. He was assigned to Group Two but started the urine alarm treatment the night that he had the Youth Psychoeducation Session. Miracle had 11 wet nights during the treatment phase and took 38 nights to meet the 14-night dry criterion. He received no additional components. Miracle had no wet nights during the over-learning or the follow-up phases.

Bella was wet every night for her 14-day baseline. She was in Group Two and started the urine alarm treatment five nights before her Youth Psychoeducation Session. Bella had 13 wet nights during the treatment phase, 10 of which occurred after the Youth Psychoeducation Session. She took 29 nights to achieve the 14-night dry criterion. Bella received no additional components. She had one wet night during the over-learning phase and one wet night at follow-up.

Jason was wet every night during his 14-day baseline. He was in Group Two and started the urine alarm treatment five nights before his Youth Psychoeducation Session. Jason had nine wet nights during the treatment phase with 8 of these after the Youth Psychoeducation Session. He took 30 nights to reach the 14-night dry criterion. Jason received no additional components and did not participate in the over-learning phase. He had no wet nights during follow-up.

## Psychometrics

Psychometric data were gathered from the CBCL, PSA and SES questionnaires to assess the characteristics of the sample and any changes that occurred across the intervention. As the current study had a small sample size, linking psychometric data to individual participants would have been too exposing. To protect participants' identities, summary statistics have been used in place of raw scores.

**Child Behaviour Checklist.** Results from the CBCL Competence and Syndrome Scales have been reported for Youth Self-Report and Parent Report. These results are presented separately with summary statistics for each subscale in Tables 7, 8, 9 and 10.

Table 7

*Summary Statistics for Youth Self-Report Child Behaviour Checklist Competence Scale*

Statistic		Activities	Social	Total Competence
Mean (SD)	PRE	11.1 (2.2)	9.8 (2.3)	51.8 (11.8)
	POST	11.3 (2.4)	9.0 (2.5)	49.4 (10.8)
Median	PRE	11.8	10.2	54.5
	POST	11.5	10.3	57.0
Range	PRE	5.8	7.0	34.0
	POST	7.8	8.0	36.0
Number Borderline	PRE	0	0	0
	POST	1	1	1
Number Clinical	PRE	0	0	1
	POST	0	0	0

*Note.* SD = standard deviation; PRE = pre-intervention; POST = post-intervention

**Youth Self-Report.** Table 7 shows the summary statistics, pre- and post-intervention, for each subscale across the CBCL Competence Scale for the Youth Self-Report. Low scores correspond to the borderline and clinical ranges. The mean median, standard deviation and range are shown in Table 7 along with the number in borderline and number in clinical ranges.

The results show some changes in participants across pre- and post-intervention; however, the scores showed little change overall. Two participants worsened for the Activities and Social Subscales by shifting from the normal range to the borderline range from pre- to post-intervention. One participant improved for the Total Competence Subscale by shifting from the clinical to the borderline range at pre- to post-intervention. The mean scores for the Competence Scale showed very little change from pre- to post-intervention.

Table 8

*Summary Statistics for Youth Self-Report Child Behaviour Checklist Syndrome Scale*

Statistic		Anxious/ Depressed	Withdrawn /Depressed	Somatic Complaints	Social Prob	Thought Prob	Attention Prob	Rule Breaking Behaviour	Aggressive Behaviour	Other Prob	Int	Ext	Total Syndrome
Mean (SD)	PRE	1.9 (2.0)	3.4 (1.8)	2.9 (2.6)	2.3 (2.3)	2.8 (2.7)	3.6 (3.1)	2.4 (2.6)	5.4 (5.8)	3.9 (1.8)	49.5 (8.5)	46.4 (11.7)	47.1 (10.9)
	POST	1.2 (1.7)	2.4 (2.1)	1.7 (2.0)	2.0 (1.7)	2.1 (2.3)	3.6 (3.0)	1.1 (1.4)	3.4 (2.8)	3.9 (1.4)	46.1 (8.5)	42.4 (6.9)	44.3 (7.6)
Median	PRE	2.0	3.0	2.0	1.5	2.5	2.5	2.0	4.0	4.0	47.0	43.0	42.5
	POST	0.5	2.5	1.5	2.0	2.0	4.0	1.0	3.0	3.5	42.0	41.0	43.5
Range	PRE	6.0	6.0	8.0	6.0	8.0	8.0	6.0	16.0	4.0	24.0	33.0	30.0
	POST	4.0	7.0	5.0	5.0	7.0	9.0	4.0	8.0	4.0	20.0	18.0	17.0
Number Borderline	PRE	0	1	0	0	0	0	0	0	0	0	1	1
	POST	0	1	0	0	0	0	0	0	0	0	0	0
Number Clinical	PRE	0	0	1	0	0	0	0	1	0	1	1	1
	POST	0	0	0	0	0	0	0	0	0	0	0	0

*Note.* SD = standard deviation PRE = pre-intervention; POST = post-intervention; Prob = problems; Int = Internalising; Ext = Externalising

Table 8 shows the summary statistics for each subscale across the Syndrome Scales in the CBCL for Youth Self-Report pre- and post-intervention. High scores correspond to the borderline and clinical ranges. Mean median, standard deviation and range are shown in Table 8 along with the number in borderline and number in clinical ranges for all of the subscales which include: Anxious/Depressed, Withdrawn/Depressed, Somatic Complaints, Social Problems, Thought Problems, Attention Problems, Rule-Breaking Behaviour, Aggressive Behaviour, Other Problems, Internalising, Externalising and Total Syndrome.

The results show that some participants improved for some of the subscales; however, the scores showed little change overall. One participant stayed the same by remaining in the borderline range for the Withdrawn/Depressed Subscale across pre- and post-intervention. One participant in each of the Somatic Complaints, Aggressive Behaviour, Internalising, Externalising and Total Syndrome Subscales showed improvement by shifting from the clinical to the normal range. One participant also showed improvement in each of the Externalising and Total Syndrome Subscales by shifting from the borderline to the normal range from pre- to post-intervention. The mean scores for the Syndrome Scale showed very little change across pre- and post-intervention.



Table 9

## Summary Statistics for Parent Report Child Behaviour Checklist Competence Scale

Report	Statistic		Activities	Social	School	Total Competence
Mother	Mean (SD)	PRE	11.8 (1.8)	8.3 (2.1)	5.2 (0.7)	51.7 (11.2)
		POST	10.5 (2.5)	8.5 (3.0)	5.1 (1.0)	48.7 (15.1)
	Median	PRE	11.7	8.0	5.3	45.0
		POST	10.3	8.5	5.3	49.0
	Range	PRE	6.2	6.3	1.8	31.0
		POST	7.3	9.0	2.5	48.0
	Number Borderline	PRE	0	0	0	0
		POST	0	1	0	1
	Number Clinical	PRE	0	0	0	0
		POST	0	0	0	1
Father	Mean (SD)	PRE	12.8 (0.7)	8.4 (1.8)	5.3 (0.4)	52.7 (3.5)
		POST	10.9 (1.4)	8.5 (2.4)	5.3 (0.4)	48.5 (6.2)
	Median	PRE	12.7	8.7	5.3	53.0
		POST	10.5	8.9	5.2	50.0
	Range	PRE	1.3	3.7	0.8	7.0
		POST	3.1	5.7	0.8	14.0
	Number Borderline	PRE	0	0	0	0
		POST	0	0	0	1
	Number Clinical	PRE	0	0	0	0
		POST	0	0	0	0

Note. SD = standard deviation; PRE = pre-intervention; POST = post-intervention

**Parent Report.** Table 9 shows the summary statistics for each subscale across the Competence Scale in the CBCL for Mother and Father Parent Report, pre- and post-intervention. Low scores correspond to the clinical and borderline ranges. Mean, median, standard deviation and range are shown in Table 9 along with the number in borderline and number in clinical ranges for both Mother and Father Report.

The results show that scores for some participants became more severe from pre- to post-intervention on some of the subscales; however, there was little change in scores overall. For Mother Report, one participant in each of the Social and Total Competence Subscales shifted from the normal to borderline range from pre- to post-intervention. One participant also shifted from the normal to clinical range across pre- and post-intervention on the Total Competence Subscale. For Father Report, one participant shifted from the normal to the borderline range for the Total Competence Subscale across pre- and post-intervention. The mean Competence Scale scores for Mother Report across the sample showed little change across pre- and post-intervention. However, for Father Report, the mean Activities Subscale score decreased two standard deviations and the mean Total Competence score decreased one standard deviation across the sample.

Table 10

*Summary Statistics for Parent Report Child Behaviour Checklist Syndrome Scale*

Report	Statistic		Anx/ Dep	Withdr/ Dep	Somatic Complaints	Social Prob	Thought Prob	Attn Prob	Rule Breaking Behaviour	Aggressive Behaviour	Other Prob	Int	Ext	Total Syndrome
Mother	Mean (SD)	PRE	1.9 (1.6)	0.3 (0.5)	1.3 (1.5)	0.9 (1.6)	3.0 (2.0)	5.3 (5.5)	1.7 (2.1)	3.3 (4.3)	5.6 (2.1)	46.9 (5.1)	46.1 (11.3)	50.6 (9.3)
		POST	1.7 (1.4)	0.3 (0.5)	1.7 (1.7)	1.6 (2.2)	2.0 (1.4)	3.9 (4.0)	2.4 (2.7)	2.9 (3.8)	3.3 (2.1)	47.3 (6.0)	46.6 (11.3)	48.3 (10.2)
	Median	PRE	2.0	0.0	1.0	0.0	3.0	3.0	1.0	1.0	5.0	46.0	45.0	48.0
		POST	1.0	0.0	2.0	1.0	2.0	2.0	1.0	2.0	3.0	47.0	46.0	44.0
	Range	PRE	4.0	1.0	4.0	4.0	6.0	12.0	6.0	10.0	5.0	16.0	28.0	26.0
		POST	4.0	1.0	4.0	6.0	4.0	11.0	7.0	10.0	5.0	15.0	29.0	26.0
	Number Borderline	PRE	0	0	0	0	1	3	0	0	0	0	2	1
		POST	0	0	0	1	0	1	0	0	0	0	0	1
	Number Clinical	PRE	0	0	0	0	0	0	0	0	0	0	0	1
		POST	0	0	0	0	0	0	0	0	0	0	0	0
Father	Mean (SD)	PRE	1.0 (1.7)	1.0 (1.7)	1.3 (0.6)	0.0 (0.0)	1.7 (1.2)	3.3 (3.1)	1.3 (1.5)	2.3 (2.5)	3.3 (1.5)	46.7 (6.1)	44.7 (10.1)	46.3 (7.1)
		POST	0.3 (0.5)	0.5 (1.0)	0.3 (0.5)	0.3 (0.5)	1.0 (1.2)	2.0 (1.4)	0.3 (0.5)	0.8 (1.0)	1.3 (1.3)	38.5 (6.1)	39.3 (3.8)	39.3 (4.0)
	Median	PRE	0.0	0.0	1.0	0.0	1.0	4.0	1.0	2.0	3.0	48.0	46.0	45.0
		POST	0.0	0.0	0.0	0.0	1.0	1.5	0.0	0.5	1.0	36.5	40.0	40.0

Range	PRE	3.0	3.0	1.0	0.0	2.0	6.0	3.0	5.0	3.0	12.0	20.0	14.0
	POST	1.0	2.0	1.0	1.0	2.0	3.0	1.0	2.0	3.0	13.0	9.0	14.0
Number Borderline	PRE	0	0	0	0	0	0	0	0	0	0	0	0
	POST	0	0	0	0	0	0	0	0	0	0	0	0
Number Clinical	PRE	0	0	0	0	0	0	0	0	0	0	0	0
	POST	0	0	0	0	0	0	0	0	0	0	0	0

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*Note.* SD = standard deviation; PRE = pre-intervention; POST = post-intervention; Anx = Anxious; Dep = Depressed; Withdr = Withdrawn; Prob = Problems; Attn = Attention; Int = Internalising; Ext = Externalising

Table 10 shows the summary statistics of the Parent Report for the subscales across the Syndrome Scale for both Mother and Father Report at pre- and post-intervention. High scores correspond to the borderline and clinical ranges. Mean, median, standard deviation and range are shown in Table 10 along with the number in borderline and number in clinical ranges for all of the subscales which include: Anxious/Depressed, Withdrawn/Depressed, Somatic Complaints, Social Problems, Thought Problems, Attention Problems, Rule-Breaking Behaviour, Aggressive Behaviour, Other Problems, Internalising, Externalising and Total Syndrome.

The results show that some participants changed for some of the subscales across pre- and post-intervention. Overall there are some indications that scores may have changed across pre- and post-interventions; however, these changes were minor and isolated to specific subscales. For Mother Report, one participant worsened shifting from the normal to borderline range across pre- and post-intervention on the Social Problems Subscale. For the Thought Problems Subscale, one participant improved by shifting from the borderline range at pre-intervention to the normal range at post-intervention. For the Attention Problems Subscale, two participants improved by shifting from the borderline to normal range and one participant stayed the same in the borderline range across pre- and post-intervention. For the Externalising Subscale, two participants improved by shifting from the borderline to normal range. For the Total Syndrome Subscale, two participants improved; one by shifting from the borderline to normal range, and the other by shifting from the clinical to the borderline range at pre- and post-intervention. For Father Report, no participants were in the borderline or clinical ranges at pre- or post-intervention. The mean Syndrome Scale scores for Mother Report across the sample show little change with only one subscale, the Other Problems Subscale indicating a small decrease of one standard deviation. The mean Syndrome Scale scores for Father report across the sample also show little change with only three subscales,

the Somatic Complaints, Other Problems and Internalising Subscales indicating slight decreases of one standard deviation.

**Parenting Scale Adolescents.** Results from the PSA Laxness and Over-Reactivity subscales and Total Scores have been reported for Mother and Father Report. These results are presented with summary statistics from each subscale in Table 11.

Table 11

*Summary Statistics for the Parenting Scale – Adolescents*

Report	Statistic		Laxness	Over-Reactivity	Total
Mother	Mean (SD)	PRE	3.3 (0.3)	3.3 (0.4)	3.2 (0.3)
		POST	3.0 (0.7)	3.1 (0.8)	2.9 (0.7)
	Median	PRE	3.3	3.2	3.3
		POST	2.8	3.2	2.9
	Range	PRE	1.0	1.2	0.6
		POST	1.7	2.3	1.8
Father	Mean (SD)	PRE	1.7 (0.7)	2.4 (0.4)	2.1 (0.5)
		POST	1.8 (0.6)	2.4 (0.5)	2.1(0.4)
	Median	PRE	1.7	2.3	1.9
		POST	1.9	2.3	2.2
	Range	PRE	1.3	0.8	0.9
		POST	1.3	1.0	0.9

*Note.* SD = standard deviation; PRE = pre-intervention; POST = post-intervention

When assessing the results from the PSA, high scores indicate dysfunctional parenting and low scores indicate adaptive parenting. The mean median, standard deviation and range are shown for each subscale and total score in Table 11. There are two subscales in the PSA: Laxness and Over-Reactivity, and all items are combined for a Total Score. The results indicate that the sample experienced little change overall across the subscales for the PSA. For the Mother Report, the mean score for both the Laxness Subscale and Total Score demonstrated a slight decrease of one standard deviation from 3.3 to 3.0 and 3.2 to 2.9

respectively. However, when examining participants individual scores, two participants had an increase for the Laxness Subscale and Total Score for Mother Report.

**Self-Efficacy Scale.** Table 12 shows the summary statistics for the SES Youth Self-Report and the SES Parent Report. Each item was rated on a 5-point Likert scale with higher scores indicating high self-efficacy and lower scores indicating low self-efficacy. The mean, median, standard deviation and range are shown in Table 12. The scores for each participant were calculated by computing the mean score across all of the items to produce one Total Score. The summary statistics then give an overview of how the sample as a whole scored on the scale. It is important to note that pre- and post-intervention scores cannot be compared as the scales were different with the items specifically targeted to pre- or post-intervention phases (see Appendix J and K). All mean scores for the SES Youth and Parent Reports across pre- and post-intervention scales were all above the neutral Likert value of 3.

Table 12

*Summary Statistics for the Self-Efficacy Scale Youth Self-Report and Parent Report*

Statistic	Youth Total Score PRE	Youth Total Score POST	Mother Total Score PRE	Mother Total Score POST	Father Total Score PRE	Father Total Score POST
Mean (SD)	4.0 (0.3)	4.4 (0.4)	4.4 (0.6)	4.6 (0.5)	4.6 (0.3)	4.8 (0.5)
Median	3.9	4.3	4.5	4.8	4.5	5.0
Range	0.9	1.0	1.6	1.0	0.8	1.0

*Note.* SD = standard deviation; PRE = pre-intervention; POST = post-intervention

Across the pre- and post-intervention scales for the SES, many of the items were constructed around similar concepts such as the bladder muscle holding urine or confidence in the ability to hold urine at night. The wording in these items was slightly different to ensure the item was relevant to the respective phase that the scale was completed in. Table 13 and 14 both compare similar items across the pre- and post-intervention SES scales.

Table 13

*Self-Efficacy Scale Item Comparison for Youth Self-Report*

Statistic		Comp 1	Comp 2	Comp 3	Comp 4	Comp 5	Comp 6
Mean (SD)	PRE	4.0 (0.5)	3.9 (0.8)	4.1 (0.4)	4.3 (0.5)	3.8 (0.7)	3.0 (1.2)
	POST	4.5 (0.5)	4.4 (0.7)	4.3 (0.7)	4.5 (0.5)	4.4 (0.7)	4.5 (0.5)
Median	PRE	4.0	4.0	4.0	4.0	4.0	3.0
	POST	4.5	4.5	4.0	4.5	4.5	4.5
Range	PRE	2	3	1	1	2	4
	POST	1	2	2	1	2	1

*Note.* Comp = item comparison; SD = standard deviation; PRE = pre-intervention; POST = post-intervention

For Youth Self-Report, when comparing mean scores for each item in Table 13, there appears to be very little change overall. There were only two items that indicated a slightly larger increase of one standard deviation: item comparison 1 and item comparison 6. These items were about the bladder muscle holding urine at night and noticing when the bladder is full to void appropriately.

Table 14

*Self-Efficacy Scale Item Comparison for Parent Report*

Report	Statistic		Comp 1	Comp 2	Comp 3
Mother	Mean (SD)	PRE	3.6 (1.6)	4.4 (0.5)	4.0 (1.7)
		POST	4.1 (1.1)	4.3 (1.8)	4.1 (1.7)
	Median	PRE	4.0	4.0	4.5
		POST	4.0	5.0	5.0
	Range	PRE	5.0	1.0	5.0
		POST	3.0	5.0	5.0
Father	Mean (SD)	PRE	4.5 (0.6)	4.8 (0.5)	4.8 (0.5)
		POST	4.8 (0.5)	4.8 (0.5)	4.8 (0.5)
	Median	PRE	4.5	5.0	5.0
		POST	5.0	5.0	5.0
	Range	PRE	1.0	1.0	1.0
		POST	1.0	1.0	4.8

*Note.* Comp = item comparison; SD = standard deviation; PRE = pre-intervention; POST = post-intervention

For Parent Report, when comparing mean scores for each item in Table 14, the results show that responses to the related items were very similar across pre- and post-intervention.



## Chapter 5

### Discussion

#### Findings

The aims of this study were to: 1) examine the efficacy of a urine alarm-based behavioural intervention for treating nocturnal enuresis in nine youth aged 11-15 years; and 2) explore whether the Youth Psychoeducation Session could reduce wet nights more rapidly. The Youth Psychoeducation Session was designed to increase motivation and autonomy for the young person receiving treatment.

**Wet nights.** Overall, the results from this study demonstrate that The Bedwetting Programme was an effective treatment for nocturnal enuresis in youth. All of the eight participants who completed the treatment achieved the dry criterion of 14 consecutive nights. This result is better than most other studies on urine alarm treatments with success rates from the existing literature usually varying between 60-85% (Bischof & Benson, 2004; Bonser et al., 1990; Brown et al., 2011; Christophersen & Vanscoyoc, 2013; Houts, 1991; Houts et al., 1994). The number of nights taken to reach the dry criterion varied across the sample with the fastest reaching criterion in 3.3 weeks and the longest reaching criterion in 22.7 weeks of treatment with the urine alarm. However, most participants reached dry criterion between three and six weeks with only two participants outside this range. This differs somewhat from the existing literature in that it is reported that treatment of nocturnal enuresis usually takes between 5-12-weeks (Brown et al., 2011; Butler, 1998, 2004; Christophersen & Vanscoyoc, 2013; Houts, 1991). Many of the participants in the current study reached the dry criterion more quickly, with five participants reaching dry criterion in less than 5 weeks, only one participant in the current sample took longer than the 5-12-week range, taking 22.7 weeks and two participants fell within this range. However, it is important to note that findings on

success rates and treatment duration may be reported differently across the literature due to how the studies are conducted.

The current study allowed participants to continue with their treatment until they reached dry criterion and data was collected on all of the participants for an extended duration. Other studies typically have a set data collection period and cease data collection after a certain date. This may be reflected in the success rates and treatment duration. The success rates may be lower as the participants that take longer to respond to treatment are marked as unsuccessful. Treatment duration may be longer than otherwise reported if these “unsuccessful” participants were able to continue with their treatment for longer periods. Although, for the current study, longer data collection only affected one participant. If this participant was instead considered unsuccessful, this would bring the success rate down to 88% which is still higher than what is reported in the literature (Bischof & Benson, 2004). This could suggest that this treatment package is more effective than other treatment packages reported on in the literature.

When considering the existing treatment packages in the literature, DBT is the package that most closely resembles The Bedwetting Programme. The treatment package in the current study included components from DBT as well as some additional components. Like DBT, the current study utilised the urine alarm, a night waking schedule for the first night of treatment, cleanliness training, increased fluid intake, positive reinforcement, positive practice and RCT. RCT was used differently in the current study with participants only receiving this component if progress was slow and FBC was small, at the discretion of clinic staff. This component was only used for one participant and appeared to be effective while it was in use (see Pies plot in Figure 3). Some other components that were used to assist participants who were progressing slowly were shaping, which involved adjusting the criterion for what was recorded as a dry night and a night waking schedule which was

different to the first night and involved waking the participant at a set time to reduce wetting. Shaping was used with one participant and appeared to have a small effect as it decreased the participant's wetting down from wetting every night (see Pies plot in Figure 3). A night waking schedule was also used with one participant and appeared to have an effect with only one wet night recorded after it was implemented (see Tactics plot Figure 3).

After each participant reached the dry criterion, the current study utilised over-learning which involved training to a higher criterion by increasing fluid intake to put more pressure on staying dry. The alarm was then phased out instead of immediately removing it. Both over-learning and alarm phase-out were used to reduce relapse. Only two out of the seven participants had wet nights at follow-up and only one of these participants qualified for relapse (14%) which has been considered to be a least one wet night per week in previous literature (Houts, Peterson, & Whelan, 1986). Relapse rates commonly reported for DBT range from 10-40% (Bollard, 1982; Bollard & Nettelbeck, 1981; Brown et al., 2011). Due to the design of the current study and small sample size, relapse rates cannot be compared with previous literature. However, as only one participant relapsed, it would be interesting to compare relapse rates from an intervention programme similar to The Bedwetting Programme with previous research, particularly on DBT. Most importantly, the over-learning and urine alarm phase-out components should be further investigated to determine whether they can reduce relapse. Over-learning may have more of an impact compared to what is alluded to in the current study. Over-learning aims to put more pressure on the participant by increasing fluid intake to reach a higher criterion which often results in relapse (Brown et al., 2011). Relapse during this phase can be a sign that enough pressure has been applied to the participant to push them to reach a more difficult criterion. Relapse was relatively low during this phase for the current study with only two out of the six participants experiencing wet nights. This could mean that not enough water was being consumed to adequately apply more

pressure to stay dry for the participants in this period. This may have meant that participants did not reach a higher criterion and over-learning was not used to its full potential in the current study.

The key difference between The Bedwetting Programme and DBT was the inclusion of the Parent Session and the Youth Psychoeducation Session. Components similar to these are not utilised in the treatment packages in the current literature. This may be a key factor as to why the treatment in the current study provided such positive results. Due to the design of the current study and limitations inherent in the clinic's timing of phases, definitive conclusions on the impact the Youth Psychoeducation Session had on treatment performance cannot be made. However, it is interesting to note that some of the participants who received the Youth Psychoeducation Session before the urine alarm reached criterion very quickly. Future research that has fewer constraints and more participants compared to the current study could further determine how the Youth Psychoeducation Session and the Parent Session can affect treatment outcomes.

**Questionnaires.** The current study also examined the characteristics of the sample using the CBCL, PSA and the SES specifically created for the study. These questionnaires were completed pre- and post-intervention. Very few studies on the urine alarm treatment utilise questionnaires to inform on the characteristics of a sample. Most researchers utilise questionnaires on a study on nocturnal enuresis to answer a specific question such as what children's views are on bedwetting (Butler & Heron, 2008) or to determine whether certain disorders and behaviour problems are more prevalent in children with nocturnal enuresis (Niemczyk et al., 2015; Redsell & Collier, 2001). However, a study on the urine alarm treatment conducted by Butler et al. (1988) did utilise questionnaires, although they are notably different from the questionnaires used in the current study.

According to the CBCL Youth Self-Report, the treatment used in the current study and the elimination of nocturnal enuresis may have resulted in some changes in youth self-reported scores from the CBCL from pre-intervention to post-intervention. The Competence Scale had mixed results with some improvement and some deterioration of scores in the borderline and clinical ranges. Two participants worsened on the Activities and Social Subscales and one participant improved for the Total Competence Subscale. These results make it difficult to draw conclusions for changes in Competence scores on the CBCL Youth Self-Report as the direction of change is unclear and changes overall are slight. The Syndrome Scale had somewhat more consistent results with some improvement and no deterioration of scores in the borderline and clinical ranges. One participant experienced no change for the Withdrawn/Depressed Subscale, one participant showed improvement for the Somatic Complaints, Aggressive Behaviour and Internalising Subscales and two participants showed improvement for the Externalising and Total Syndrome Subscales. These results indicate that there was little change in youth self-reported Syndrome Scale CBCL scores with slight improvements isolated to specific subscales. Overall, these results from youth self-report suggest that the treatment of nocturnal enuresis may not cause wider changes to behavioural and emotional problems. More research is needed to determine whether treatment of nocturnal enuresis can produce a change in this area.

According to the CBCL Parent Report, results suggested a deterioration in the Competence Scale after the intervention. For Mother Report, one participant worsened on the Social Subscale and two participants worsened on the Total Competence Subscale. For Father Report, one participant worsened for the Total Competence Subscale. It is also interesting to note that the mean score for the Activities Subscale had a reasonable drop of two, almost three standard deviations. This could suggest that the Activities Subscale also worsened for Father Report. These results indicate little change overall in Competence Scale scores for

Parent Report with only slight deterioration in some of the subscales. The Syndrome Scale results show that most participants improved after intervention with few deteriorations; however, this was mostly found in Mother Report. For Mother Report, one participant worsened for the Social Problems Subscale, some participants improved on the Thought Problems, Attention Problems, Externalising and Total Syndrome Subscales and one participant had no change for the Attention Problems Subscale. Results also indicate some improvement for the Other Problems Subscale for Mother Report as the mean score decreased slightly. These results could suggest that participants may have improved after intervention for Syndrome Subscale scores for Mother Report. There was very little change for Father Report in the Syndrome Scales. However, mean scores for the Somatic Complaints, Other Problems and Internalising Subscales indicated a slight decrease. This may suggest that participants improved in these areas after intervention for Father Report. The results for the Syndrome Scale Parent Report indicate very little change with only slight indications of improvement for some of the subscales. Overall, the results from Parent Report suggest that the treatment of nocturnal enuresis may not cause changes in behavioural and emotional problems in their children. More research is needed to determine how the treatment of nocturnal enuresis can change Parent Reported behaviour and emotional problems.

For the PSA, Mothers reported a slight improvement in parenting on Laxness and Total scores. However, for Father Report any changes were small. Results from the PSA suggest that there was little change in parenting styles across pre- and post-intervention. Participating in a behavioural bedwetting programme and treatment of nocturnal enuresis may not cause changes to parenting styles. However, more research is needed to further determine the impact these treatment programmes could have on parenting styles.

According to the SES, the mean scores for the Youth, Mother and Father Reports all indicated higher self-efficacy. This could help explain why participants produced such positive results in the current study. Bandura (1977) has outlined the importance of self-efficacy when attempting to change behaviour as it can determine whether people persist when challenges arise, how much effort people put into changing the behaviour and whether they decide to adopt the new behaviour. Higher self-efficacy could then be understood to increase the likelihood of changes in behaviour to occur and therefore producing positive results in behavioural interventions. It is interesting to point out that the age of the sample used in the current study was older than what is typical for the existing literature. It would be interesting for future research to investigate whether increased age could relate to higher self-efficacy and improved treatment outcomes. Further research on how self-efficacy can affect treatment outcomes for participants is needed. From comparing similar items from the pre- and post-intervention SES for Youth Self-Report, two item comparisons seemed to demonstrate an increase. This could suggest that participants' self-efficacy may have increased for the ability of the bladder muscle to hold urine at night and to notice when their bladder is full at night to void appropriately. Item comparisons for Parent Report suggest little change in scores across pre- and post-intervention. However, more research is needed to examine how self-efficacy may change across a bedwetting intervention.

### **Factors Influencing Results**

The current positive result applying to all the participants in The Bedwetting Programme indicated that the results were likely free from the influence of external factors. Many factors can influence results in research. Family dynamics, unsatisfactory housing, failure to wake to the alarm, unreliability of the alarm, history of treatment failure, parental intolerance, use of punishment, lack of motivation, behaviour problems and lack of supervision are all factors reported in the literature that claim to influence treatment for

nocturnal enuresis (Brown et al., 2011; Butler, 1998, 2004). Many of these factors were addressed in a manner which was integral to the current study. Participants received high levels of supervision with visits to the clinic and frequent phone calls from Child and Family Psychology placement students to monitor progress and assist with any problems that arose.

The CBCL was used to indicate behaviour problems to the researchers and clinic staff. This information was used to resolve any issues that behaviour problems may have led to. Behaviour problems were also assessed through the screening process at the PDC. Psychologists and Child and Family Psychology placement students determined what impact the behaviour problems could have on treatment. Clinic staff worked with families to mitigate any behaviour problems where possible by keeping in consistent contact with the families to monitor progress, working through any issues that arose and offering support. If these behaviour problems were determined during the screening process to interfere with the ability of the family to carry out the treatment, the family was not invited to participate in The Bedwetting Programme.

Lack of motivation was examined somewhat through the SES which found self-efficacy to be high in the sample. In addition, the current study aimed to rectify any influence lack of motivation could have on results through the Youth Psychoeducation Session. A major component of the Youth Psychoeducation Session was to increase participants' motivation.

Potential issues with the urine alarm were mitigated by testing all of the alarm units to ensure that they were working appropriately. Should participants experience any problems, this would have been communicated with the clinic staff and appropriate solutions would have been worked through with the family such as replacing the alarm or altering how it was used. Any other issues that families experienced including family dynamics, unsatisfactory



housing, parental intolerance and use of punishment were monitored by clinic staff and solutions were found where possible by working with and supporting the families.

### **Limitations**

One limitation to the current study was the baseline period. The current study needed participants to complete a continuous baseline up until they received treatment.

Unfortunately, the clinic staff mistakenly undertook the usual 14-day baseline for The Bedwetting Programme and did not extend the baseline until the beginning of treatment. This meant that there were gaps in the data before the urine alarm implementation. In some cases, bedwetting data was not recorded when the Parent Session and Youth Psychoeducation Session components were implemented. Therefore, any effect of these components is not evident where participants had gaps in the data when the Parent Session or Youth Psychoeducation Sessions were implemented. In addition, this meant that for some participants, a complete pattern of bedwetting during baseline up until the urine alarm was implemented cannot be determined. A continuous baseline would have strengthened the current study. This limitation could be simply addressed in future research by utilising a continuous baseline.

Another limitation in the current study was the restrictions of the AB design. The study examined the efficacy of a pre-existing psychological intervention: The Bedwetting Programme. This meant that the programme had a predetermined structure that had restrictions on what could be manipulated for research purposes and specifically precluded a multiple-baseline design across participants. The Parent Session was fixed to one day for all participants. This meant that for the current study, the Parent Session could not be manipulated by researchers to occur at different times across the sample. There were also constraints for when the next phase in treatment could be implemented. This meant that there was not enough time after the Parent Session and before the next treatment component to

assess changes in bedwetting as a result of the Parent Session. Some participants in the current study needed to start the urine alarm component only days after the Parent Session. Therefore, the influence the Parent Session had on treatment could not be assessed.

The Youth Psychoeducation Sessions were restricted to a Wednesday or Thursday across two weeks. This small flexibility allowed the researchers to manipulate when some participants received the Youth Psychoeducation Session which allowed for the groups to be introduced. The current study set out to have two groups: Group One who received the Youth Psychoeducation Session first and Group Two who received the urine alarm first. The current study prioritised staggered implementation of the urine alarm as this was the key component of The Bedwetting Programme. The urine alarm was then implemented around the Youth Psychoeducation Sessions for the respective groups. However, as the youth sessions were restricted to occur across two weeks, the dates that the urine alarm could be implemented were also restricted. This meant that there were only small periods between the Parent Session, Youth Psychoeducation Session and urine alarm components. In addition, the Youth Psychoeducation Sessions could not be staggered across the whole sample in order to retain the staggering of the urine alarm and to keep the sessions across the two weeks. As a result, the full effect of the Youth Psychoeducation Session could not be assessed as there was not enough time between components and the session could not be adequately staggered. The group aspect from the current study was exploratory and could only allude to whether the Youth Psychoeducation Session could have the potential to affect treatment outcomes.

There were some errors in the implementation of the current study worth noting. Some participants did not follow their allocated treatment plan for their assigned group accurately. Miracle started the urine alarm treatment the same day as the Youth Psychoeducation Session. This was likely due to complex living circumstances out of clinic staff and researchers' control. Subsequently, although this participant was allocated to receive

the urine alarm before the Youth Psychoeducation Session, this did not happen. Therefore, it was not possible to collect data between the urine alarm and the Youth Psychoeducation Session for this participant. In addition, Jason did not participate in the over-learning phase of treatment due to a decision made by the family. However, it appears that this may not have affected results for Jason as he did not have any wet nights during follow-up. Although, it is still possible that relapse will be more likely for this participant compared to when over-learning is used.

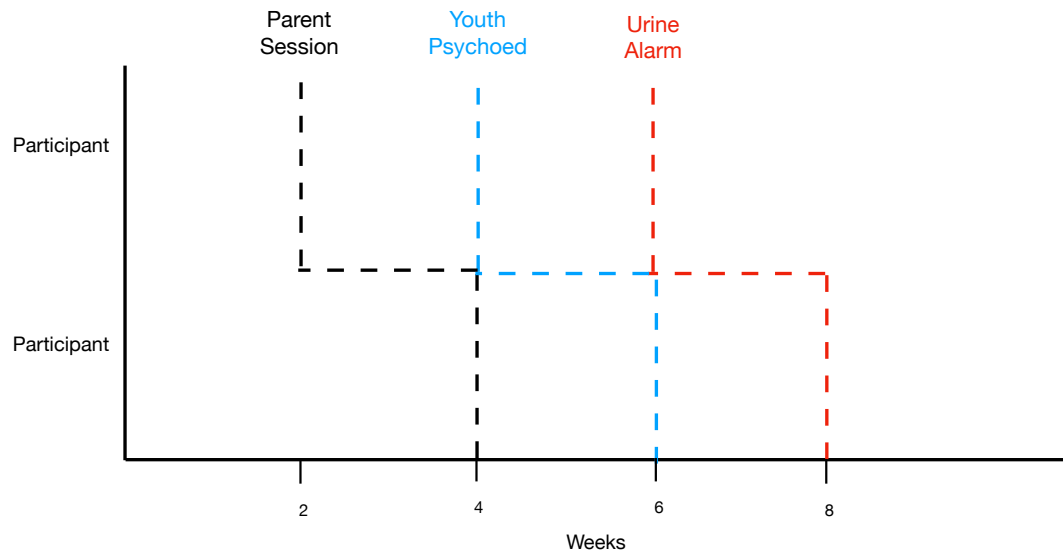
The psychometrics from the CBCL, PSA and SES were not linked to participants due to the small sample size of the current study. Results from the psychometrics were limited to report across the sample as a whole so that participants' identities could be protected. The researchers decided that linking the psychometric data to the bedwetting data would make it possible for the participants to work out the psychometric results of the other participants. This meant that conclusions could not be drawn on how the results from the psychometrics could relate to how individual participants performed in The Bedwetting Programme. Nonetheless, the resolution of bedwetting for all of the participants would have limited the utility of these data even should they have been available.

Changes in self-efficacy could not be adequately assessed in the current study. The SES was specifically created for the current study and was constructed prior to intervention, with much of the scale targeting the treatment programme. This meant that for post-intervention, a different scale needed to be created as many of the items were no longer applicable. As a result, pre- and post-intervention scores from the SES were not comparable. However, as many of the items from the pre- and post-intervention versions of the scale were centred around similar concepts, an item comparison was conducted. This allowed researchers to compare how items were scored that were similar across pre- and post-intervention versions. Two item comparisons indicated a slight increase in self-efficacy for

the ability of the bladder muscle to hold urine at night and to notice when their bladder is full at night to void appropriately. However, this is only an indication of how self-efficacy could change across this intervention programme. It would have been beneficial to create a general SES with identical versions implemented at pre- and post-intervention for youth and parent report so that changes in self-efficacy could be examined more accurately.

### **Future Research**

Future research could address many of the limitations that arose for the current study. It would be interesting to conduct a study on an intervention programme that is similar to The Bedwetting Programme that allows researchers to control the timing of treatment components for each participant. This would allow a multiple baseline across participants design to be utilised which would provide more insight into the effects each key treatment component has on bedwetting compared to the AB design that was used in the current study. Ideally, future research should aim to have two weeks between the implementation of each treatment component. This would provide enough data for researchers to adequately assess whether treatment components affected bedwetting. Baseline lengths should be assigned to participants randomly which will determine when they receive the first component of treatment: The Parent Session. Then, the other key components: The Youth Psychoeducation Session and the urine alarm treatment should be staggered across participants. Figure 4 shows an outline of what this design could look like. However, when considering how The Bedwetting Programme was designed, it is important to note that The Parent Session is intended to be carried out with a group of participants at the same time. Future research could alter this session so that it can be presented to individual participants. This would allow all components to be staggered across all participants (see Figure 4).



*Figure 4.* Ideal multiple baseline across participants design.

*Note.* Youth Psychoed = Youth Psychoeducation Session.

Larger sample size would open opportunities for further analysis. It would be interesting to link psychometric data such as the CBCL, PSA and SES that were used in the current study to individual participants. The SES would be particularly interesting due to the research on how self-efficacy can determine how an individual responds to challenges when seeking to change a behaviour (Bandura, 1977). It has been reported that treatment is more likely to be successful if participants are motivated and have greater expectations for success (Butler, 1998; Nevéus, 2011). More knowledge on what characteristics cause individuals to respond better or worse than others to the treatment of nocturnal enuresis would be valuable. This information could assist in developing more individualised treatment programmes to maximise any pre-existing characteristics that could enhance treatment outcomes and minimise the effect of any characteristics that are associated with poor treatment outcomes. In addition, it is of interest to examine the changes in individuals after receiving a treatment programme for nocturnal enuresis as the treatment may have an impact on a wide range of areas that are currently unknown. Future research should ensure that the psychometrics are comparable across pre- and post-intervention so the full impact of the treatment can be assessed.

The Bedwetting Programme was based on DBT which has faced criticism due to the demand and stress that it can place on families (Bonser et al., 1990; Brown et al., 2011; Butler, 2004). Some researchers have proposed that challenging and complex components should be removed from these treatment programmes if they are deemed unnecessary for treatment success (Butler, 2004). The night waking schedule for the first night with the urine alarm from The Bedwetting Programme is particularly demanding. It may be useful to determine whether treatment programmes produce improved results if this component is utilised. Future research could assess this by adopting a group design for the night waking schedule on the first night of urine alarm treatment. One treatment group could include the hourly waking for the first night, and the other treatment group could remove this component. Results could then be compared to examine whether the group with the hourly awakenings had improved treatment outcomes compared to the group with no awakenings. If there is no difference between the two groups, removal of the night waking schedule for the first night with the urine alarm could be considered. This would reduce the burden of the treatment programme on families.

Further research on older age groups would add to the literature. The current research on the treatment of nocturnal enuresis for older children and adults is scarce. Additional research in these age groups would build on the current knowledge and help to determine what interventions are effective for older children and adults. The Bedwetting Programme that was used in the current study was altered to appeal to older children by increasing autonomy and independence and making resources more age appropriate. More intervention programmes such as this one with research assessing efficacy are needed so that the treatment of nocturnal enuresis for older children and adults can be properly understood.

## Conclusions

There are two main conclusions from the current study. Firstly, The Bedwetting Programme has demonstrated to be an effective treatment for older children. The whole sample of the current study reached the dry criterion with many participants achieving this quickly, in under 5 weeks. Secondly, further research on the Youth Psychoeducation Session utilised in the current study is warranted as this may have the potential to affect treatment performance. There was some indication that participants who received the Youth Psychoeducation Session first may have achieved the dry criterion more quickly than the other participants.

The positive findings from the current study suggest that it may be worthwhile to include a session like the Youth Psychoeducation Session that educates and motivates families, particularly youth. The positive result of a 100% success rate from the current study shows that treatment such as The Bedwetting Programme, that targets youth and allows independence and autonomy, is beneficial for treating nocturnal enuresis in older children. These strong results also suggest that including the other components utilised in The Bedwetting Programme such as the Parent Session and maintaining consistent contact and support for families from professionals may strengthen the efficacy of the treatment.

Future research is needed to further ascertain which components of The Bedwetting Programme strengthen the efficacy of the treatment. However, the current study does provide some important insight into what treatment is effective for older children and what components could provide additional benefits to treatment programmes for nocturnal enuresis.

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## Appendix A

### School Newsletter

#### Bedwetting programme for teenagers

Is your teenagers' confidence affected by bedwetting? Are you sick of wet beds or the cost of pull-ups?

There is a funded, **effective programme for treating bedwetting** which will be tailored for teenagers, starting in July at the University of Canterbury's Pukemanu/Dovedale Clinic. If you are a parent or caregiver of a youth aged between 13 and 18 who is dry during the day but wet at night, then this programme could help.

Further information is available on the Pukemanu Clinic website:

<http://www.canterbury.ac.nz/education/schools-and-departments/school-of-health-sciences/dovedale-centre---pukemanu/> (see the "Bedwetting brochure" under "useful links" on the right side of the webpage)

Referral form can be downloaded from: <http://www.canterbury.ac.nz/education/schools-and-departments/school-of-health-sciences/dovedale-centre---pukemanu/referral-form/>

For queries email: [hscclinic@canterbury.ac.nz](mailto:hscclinic@canterbury.ac.nz) or phone: (03) 369 0130

Places are limited. Early completion of the referral form is advised

## **Appendix B**

### **Email to Urologists, Paediatricians and Medical Practices**

Dear [clinic name]

Please refer the following email to doctors at your clinic where appropriate.

In July this year the Child and Family Psychology clinic at the University of Canterbury (Pukemanu-Dovedale Centre) will be running a bedwetting programme for high school-aged referrals. The standard enuresis programme will be tailored to this older age group and results monitored.

You are welcome to refer to the programme any patients who are in the 13 -18 year age-range and who have no problems with diurnal enuresis or encopresis and are capable of following a behavioural treatment programme. More information on the programme and a referral form are available on the Pukemanu-Dovedale Centre's website <http://www.canterbury.ac.nz/education/schools-and-departments/school-of-health-sciences/dovedale-centre---pukemanu/> or you can phone 03 369 0130 ext. 90130 or email HSC Clinic Shared Mailbox [hscclinic@canterbury.ac.nz](mailto:hscclinic@canterbury.ac.nz)

## **Appendix C**

### **Radio Community Notice**

Is your teenager experiencing problems with bedwetting? Is it affecting their confidence?

Are you sick of wet beds or the cost of pull-ups?

There is a funded, evidence-based programme for treating bedwetting that has been designed for teenagers, starting in July at the University of Canterbury's

Pukemanu/Dovedale Clinic. If you are a parent or caregiver of a teenager aged between 13 and 18 who is dry during the day but wet at night, then this programme could help.

For further information, please contact the clinic by phone on (03) 369 0130 or by email at [hscclinic@canterbury.ac.nz](mailto:hscclinic@canterbury.ac.nz)

Places in the programme are limited. Early contact with the clinic is advised.

## Appendix D

### Human Ethics Committee Approval Notice

HUMAN ETHICS COMMITTEE

Secretary, Rebecca Robinson  
Telephone: +64 03 369 4588, Extn 94588  
Email: [human-ethics@canterbury.ac.nz](mailto:human-ethics@canterbury.ac.nz)



Ref: HEC 2018/44

2 July 2018

Emma Gray  
Health Sciences  
UNIVERSITY OF CANTERBURY

Dear Emma

The Human Ethics Committee advises that your research proposal “The Efficacy of the Urine Alarm Treatment for Nocturnal Enuresis in Adolescents” has been considered and approved.

Please note that this approval is subject to the incorporation of the amendments you have provided in your email of 26 June 2018.

Best wishes for your project.

Yours sincerely

*R. Robinson*  
pp.

Professor Jane Maidment  
**Chair**  
*University of Canterbury Human Ethics Committee*



## Appendix E

### Youth Information Sheet

#### Information Sheet



Department: School of Health Sciences  
Email: emma.gray@pg.canterbury.ac.nz  
2<sup>nd</sup> July 2018

### **Efficacy of an intervention for nocturnal enuresis in adolescents** **Information Sheet for youth**

My name is Emma Gray. I am a masters student in Child and Family Psychology at the University of Canterbury. I am carrying out some research on bedwetting for my degree. This research will be used to find out how well the urine alarm treatment works for bedwetting in young people and whether the programme could be changed to make it better.

This study relates to the bedwetting programme that you and your parent(s)/guardian(s) wish to be in. If you and your parent(s)/guardian(s) agree to take part in the study, you will go through the bedwetting programme as normal and the research team will be able to use some of the information you and your parent(s)/guardian(s) provide. The order and of some the timing of the parts to the programme may change if you choose to take part in the research but you will still go through the whole programme. This should not affect how well you do in the programme. You will also complete some other parts with your parent(s)/guardian(s) that will be used for research and are not part of the bedwetting programme. This includes a form that will ask you about your confidence in taking part in the programme and a session with your parent(s)/guardian(s) and researchers at the end of the programme where you will talk about your experiences and whether you think the programme should be changed in any way to make it better. There will be very little difference between the people who choose to participate in the study and those who choose not to.

You are taking part in a bedwetting treatment programme at the Pukemanu/Dovedale Centre (PDC). As part of that, you and your parent(s)/guardian(s) will fill in some diaries and questionnaires. If you and your parent(s)/guardian(s) agree to take part in this research, then I and my supervisors will have access to some information from the diary and questionnaires that you and your parent(s)/ guardian(s) will complete as part of the treatment programme. If you do not want to take part in this research, you will still be able to receive the treatment and none of your information will be used in the study.

For the treatment programme, there will be some time before the treatment begins where you will complete a diary with help from your parent(s)/guardian(s) if you need it. You will record any night-time wetting in the diary. You will then go through a screening

period which will help to determine if the treatment is right for you. You and your parent(s)/guardian(s) will meet with the therapist and complete some clinic measures. The only information used for research from this will be ages and genders of everyone participating and whether they have other problems, in addition to bedwetting.

Before you start the treatment part of the programme, you will be given some information about bedwetting and how the treatment works. You will continue to keep a record of bedwetting in the diary with help from your parent(s)/guardian(s) if needed. You will attend an information session either before or after the treatment starts.

The treatment programme involves a night-time urine alarm which is placed on the bed and will go off when drops of urine touch it. You will use the urine alarm for usually at least six weeks and continue to record any bedwetting in the diary. During this time, it is very likely night-time wetting will improve. If at any point you begin wetting again, you can go back to the treatment.

If you and your parent(s)/guardian(s) choose to take part in this research, you will go through the treatment programme run by the PDC. No information used for this research will identify who you are. Information on your age, your gender and if there are other problems will be gathered but put with information from the other participants, so we will not be able to tell who the information came from. You and your parent(s)/guardian(s) will be asked to complete a form with questions on confidence in handling the bedwetting and to take part in a short interview after the treatment has finished to find out how it was for you and whether you think the programme could be improved in any way. This information too will be put with the information from other participants, so no-one can figure out what information is from what participant.

Information from the diaries on bed-wetting and on your Functional Bladder Capacity will also be used in the study. Functional Bladder Capacity is a measure to see how much liquid your bladder can hold. You will be taught how to measure this and can do it at home. Again, no-one will be able to work out who you are. This information will be graphed.

There is a chance that you may experience some added stress from taking part in the study. Some people may find it upsetting answering questions about their confidence in the form or talking about their experiences with the treatment in the session at the end of the programme. If you become upset at any time, tell your parent or one of the therapists at the clinic. You will be supported by the therapists at the clinic throughout the programme.

You and your parent(s)/guardian(s) can choose whether to take part in the study or not, and you can withdraw at any stage. You may ask for any information that you or your parent(s)/guardian(s) gave us to be returned to you or destroyed at any point. If you withdraw, I will remove information relating to you. However, after September, it will be difficult to remove from the study because it will be put with the other data.

The results of the study will be written up in a thesis and may be published, but your identity will not be made public without your permission. To make sure no one can see who you are, you will be given another name that will be used in place of your real name. You can help choose this fake name that will be used to identify you. A record of the fake names will be kept separate from other materials.

The research team which includes myself, my three supervisors Associate Professor Karyn France, Dr Michael Steele, and Julie Densem (registered clinical psychologist and

programme facilitator) and other staff from the PDC who are involved in conducting the treatment will have access to the information you and your parent(s)/guardian(s) provide. Data will be secured in password-protected files on password-protected computers and will be stored safely for five years, and then destroyed. The thesis will be a public document and will be available through the UCLibrary.

Please indicate to the researcher, on the assent form if you would like to receive a copy of the summary of results of the project.

The project is being carried out as a requirement for a Master of Science in Child and Family Psychology by Emma Gray ([emma.gray@pg.canterbury.ac.nz](mailto:emma.gray@pg.canterbury.ac.nz)) under the supervision of Associate Professor Karyn France ([karyn.france@canterbury.ac.nz](mailto:karyn.france@canterbury.ac.nz)), Dr Michael Steele ([michael.steele@canterbury.ac.nz](mailto:michael.steele@canterbury.ac.nz)) and Julie Densem ([julie.densem@canterbury.ac.nz](mailto:julie.densem@canterbury.ac.nz)), who can be contacted through their emails. We will be pleased to discuss any concerns you may have about participation in the project.

This project has been reviewed and approved by the University of Canterbury Human Ethics Committee, and participants should address any complaints to The Chair, Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch ([human-ethics@canterbury.ac.nz](mailto:human-ethics@canterbury.ac.nz)).

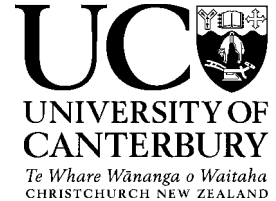
If you agree to participate in the study, you are asked to complete the assent form and return to:

Emma Gray  
School of Health Sciences  
University of Canterbury  
Private Bag 4800  
Christchurch 8140

## Appendix F

### Parent Information Sheet

#### Information Sheet



Department: School of Health Sciences  
Email: emma.gray@pg.canterbury.ac.nz  
2<sup>nd</sup> July 2018

### **Efficacy of an intervention for nocturnal enuresis in adolescents** **Information Sheet for parents**

My name is Emma Gray. I am a masters student in Child and Family Psychology at the University of Canterbury. I am working with the clinical staff at the Pukemanu/Dovedale Clinic (PDC) to carry out this research on nocturnal enuresis (bedwetting) for the second year of my masters. This research will be used to determine how effective the urine alarm treatment is for nocturnal enuresis in adolescents and the additional role of motivation. Researchers are also wanting to determine whether the bedwetting treatment programme could be improved in any way.

This study is related to the bedwetting treatment programme your teenager has been referred to at the PDC. If you agree to take part in the study, yourself and your teenager will go through the bedwetting programme as normal and researchers will have access to some of the information you provide to the clinic. This information will be included anonymously in the study. There may be some changes in the timing and order of components from the programme but there is no evidence that this will impact the effectiveness of the programme. You will still receive all of the components from the programme. You will also complete some additional components for research purposes that would not otherwise be included in the bedwetting programme. These components include a parent and youth self-efficacy questionnaire and an exit interview that will be used to determine the experiences of you and your child with the programme and whether any improvements could be made.

Yourself and your teenager will complete a series of measures as part of the bedwetting programme. If you agree to take part in the study, then I and my supervisors will have access to your diary, data from initial screening measures, the Child Behaviour Checklist (CBCL) and Functional Bladder Capacity results. Functional Bladder Capacity is a measure of how much liquid the bladder can hold. Data from the initial screening measures will include demographic data such as age and gender. Data from the CBCL and screening measures will be pooled with the other participants, so your teenager will not be identifiable. If you do not agree to take part, you will still be offered the bedwetting programme and none of your information will be used for research purposes.

The treatment programme involves an evidence-based approach which will be negotiated with you and your teenager at the clinic. It will first involve a baseline period in which you

will assist your teenager as needed to complete a diary that will be used to record any night-time wetting and the night these wets occur (researchers will receive a copy of this). A screening interview will then be carried out by the clinic where you and your teenager will meet with the therapist and complete some measures as part of the PDC bedwetting programme. Your teenager will be taught to measure his or her Functional Bladder Capacity which can be done easily at home. Once the baseline period is complete your teenager will continue to use the diary and you will attend a session where you will receive information about bedwetting and how the intervention that is part of the programme works. Your teenager will attend a psychoeducation session either before or after the intervention starts.

The treatment used in the bedwetting programme consists of a night-time urine alarm which is placed on the bed and will sound when liquid comes in contact with it. Your teenager will use the urine alarm usually for at least six weeks and you will be asked to assist your teenager as needed to continue to record any wets that may occur. During this time, it is very likely the night-time wetting will improve. If at any point progress slips back, then the treatment can be re-introduced.

If you and your teenager choose to take part in this study, you will go through the treatment programme as is standard practice in the PDC. General data on the demographics (age, gender etc.) of the group and any other problems experienced by the teenagers will be gathered from the PDC screening process but will not identify your teenager specifically. Other data we will use for research purposes from the programme will include your diaries on bed wetting and Functional Bladder Capacity. In addition, you and your teenager will be asked to complete a self-efficacy questionnaire and to participate in a short interview after the treatment programme has been completed. The self-efficacy questionnaires will measure how confident you and your child are in terms of following a treatment programme. The interview will be used to determine your experiences with the treatment and whether it could be improved in any way. The exit interview and the self-efficacy questionnaires are additional components added for research purposes and are not part of the standard PDC treatment programme.

Although it is not anticipated that the participants of the research will experience any additional stress from the study, it is possible that participants may become upset as you are asked to draw additional attention to certain aspects of your clinical issues. Specifically being asked additional questions about your confidence through the self-efficacy scale and going over your experiences in the exit interview. There will be very little difference in experiences between those who choose to participate in the research and those who do not. You and your teenager will be well supported by PDC staff. Families are encouraged to share any issues they have with the clinic staff of the research team. For this treatment programme, the clinic staff will include two placement year Child and Family Psychology students and a registered clinical psychologist. My three supervisors for the research project are registered psychologists in New Zealand. All will be monitoring for any problems.

Participation is voluntary, and you have the right to withdraw at any stage without penalty. You may ask for your raw data to be returned to you or destroyed at any point. If you withdraw, I will remove information relating to you and your teenager. However, once analysis of raw data starts in September, it will become increasingly difficult to remove the influence of your data on the results.

The results of the project will be written up in a thesis and may be published in an academic journal or at a conference, but you may be assured of the complete confidentiality of data gathered in this investigation: your identity will not be made public without your prior consent. To ensure anonymity and confidentiality, your teenager will be given another name that will be used in place of your name for all of your data that you have provided. Your teenager can help choose this pseudonym. A record of pseudonyms will be kept separate from all other data.

The research team which includes myself, my three supervisors Associate Professor Karyn France, Dr Michael Steele, and Julie Densem (registered clinical psychologist and programme facilitator) and other staff from the PDC who are involved in conducting the treatment will have access to your data. Data will be secured in password-protected files on password-protected computers and will be stored safely for five years, and then destroyed. The thesis will be a public document and will continue to be available through the UC Library.

Please indicate to the researcher, on the consent form if you would like to receive a copy of the summary of results of the project.

The project is being carried out as a requirement for a Master of Science in Child and Family Psychology by Emma Gray ([emma.gray@pg.canterbury.nz](mailto:emma.gray@pg.canterbury.nz)) under the supervision of Associate Professor Karyn France ([karyn.france@canterbury.ac.nz](mailto:karyn.france@canterbury.ac.nz)), Dr Michael Steele ([michael.steele@canterbury.ac.nz](mailto:michael.steele@canterbury.ac.nz)) and Julie Densem ([julie.densem@canterbury.ac.nz](mailto:julie.densem@canterbury.ac.nz)), who can be contacted at [on their respective emails](#). They will be pleased to discuss any concerns you may have about participation in the project.

This project has been reviewed and approved by the University of Canterbury Human Ethics Committee, and participants should address any complaints to The Chair, Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch ([human-ethics@canterbury.ac.nz](mailto:human-ethics@canterbury.ac.nz)).

If you agree to participate in the study, you are asked to complete the consent form and return to:

Emma Gray  
School of Health Sciences  
University of Canterbury  
Private Bag 4800  
Christchurch 8140

## Appendix G

### Youth Assent Form

#### Assent Form



Department: School of Health Sciences  
Email: [emma.gray@pg.canterbury.ac.nz](mailto:emma.gray@pg.canterbury.ac.nz)

### **Efficacy of an intervention for nocturnal enuresis in adolescents** **Assent Form for youth**

- ☐ I know what is involved in this study and was able to ask questions.
- ☐ I understand what I need to do if I agree to take part.
- ☐ I know I can withdraw from the study if I wish and remove my information if this can still be done.
- ☐ I know I will take part in the bedwetting programme run by the PDC. The information, listed in the information sheet will be available to the researchers. I will also have an interview with my parent(s)/guardian(s) at the end of the programme about how I got on and I will complete a questionnaire on my confidence in handling my bedwetting.
- ☐ I know that my information will be kept private to the researcher, the research team, Julie Densem and other staff from the Pukemanu/Dovedale Centre who are involved in carrying out the treatment. Any published or reported results will not include who I am. I understand that a thesis is a public document and will be available through the UC Library.
- ☐ I understand that all information collected for the study will be kept in locked and secure facilities and/or in a password-protected electronic form and will be destroyed after five years.
- ☐ I understand the risks associated with taking part in the study and that I should talk to a parent or a therapist at the clinic if I become upset at any time.
- ☐ I understand that I can contact the researcher Emma Gray ([emma.gray@pg.canterbury.ac.nz](mailto:emma.gray@pg.canterbury.ac.nz)) or one of the supervisors Associate Professor Karyn France ([karyn.france@canterbury.ac.nz](mailto:karyn.france@canterbury.ac.nz)) or Dr Michael Steele ([michael.steele@canterbury.ac.nz](mailto:michael.steele@canterbury.ac.nz)) for further information. If I have any complaints, I can contact the Chair of the University of Canterbury Human Ethics Committee, Private Bag 4800, Christchurch ([human-ethics@canterbury.ac.nz](mailto:human-ethics@canterbury.ac.nz))
- ☐ I would like a summary of the results of the project.
- ☐ By signing below, I agree to participate in this research project.

Name: \_\_\_\_\_ Signed: \_\_\_\_\_ Date: \_\_\_\_\_

Email address (*for report of findings, if applicable*):

---

Please return the assent form to:

Emma Gray  
School of Health Sciences  
University of Canterbury  
Private Bag 4800  
Christchurch 8140



## Appendix H

### Parent Consent Form

#### Consent Form



Department: School of Health Sciences  
Email: [emma.gray@pg.canterbury.ac.nz](mailto:emma.gray@pg.canterbury.ac.nz)

### **Efficacy of an intervention for nocturnal enuresis in adolescents** **Consent Form for parents**

- ☐ I have been given a full explanation of this project and have had the opportunity to ask questions.
- ☐ I understand what is required of me if I agree to take part in the research.
- ☐ I understand that participation is voluntary, and I may withdraw myself and my teenager at any time without penalty. Withdrawal of participation will also include the withdrawal of any information I or my teenager have provided should this remain practically achievable.
- ☐ I understand that I will need to participate in the treatment programme run by the PDC and that to be part of the study the data specified in the information sheet will be available to researchers. I will take part in an interview with my teenager after the completion of the treatment and my teenager will complete a youth self-efficacy questionnaire.
- ☐ I understand that any information or opinions I provide will be kept confidential to the researcher, the research team, Julie Densem and other staff from the PDC who are involved in conducting the treatment. Any published or reported results will not identify the participants. I understand that a thesis is a public document and will be available through the UC Library.
- ☐ I understand that all data collected for the study will be kept in locked and secure facilities and/or in password-protected electronic form and will be destroyed after five years.
- ☐ I understand the risks associated with taking part and how they will be managed.
- ☐ I understand that I can contact the researcher Emma Gray ([emma.gray@pg.canterbury.ac.nz](mailto:emma.gray@pg.canterbury.ac.nz)) or one of the supervisors Associate Professor Karyn France ([karyn.france@canterbury.ac.nz](mailto:karyn.france@canterbury.ac.nz)) or Dr Michael Steele ([michael.steele@canterbury.ac.nz](mailto:michael.steele@canterbury.ac.nz)) for further information. If I have any complaints, I can contact the Chair of the University of Canterbury Human Ethics Committee, Private Bag 4800, Christchurch ([human-ethics@canterbury.ac.nz](mailto:human-ethics@canterbury.ac.nz))
- ☐ I would like a summary of the results of the project.
- ☐ By signing below, I agree to participate in this research project.

Name: \_\_\_\_\_ Signed: \_\_\_\_\_ Date: \_\_\_\_\_

Email address (*for report of findings, if applicable*):

---

Please return the consent form to:

Emma Gray  
School of Health Sciences  
University of Canterbury  
Private Bag 4800  
Christchurch 8140

## Appendix I

### The Parenting Scale – Adolescents

#### Parenting Scale — Adolescents

At one time or another, all children misbehave or do things that could be harmful, that are 'wrong' or that parents don't like. Examples include: hitting someone, whining or complaining, damaging things, forgetting homework, leaving things lying around, lying, being over-emotional, refusing to follow requests, breaking family rules, swearing, taking other people's things, staying out late.

Parents have many different ways or styles of dealing with these types of problems. Below are items that describe some styles of parenting. For each item, circle the number that best describes your style of parenting during the past 2 months with your teenager.

#### Sample item

At meal time...

I let my teenager decide what to eat.	1	2	3	4	5	6	7	I decide what my teenager eats.
--	---	---	---	---	---	---	---	------------------------------------

1. When I give fair threat or warning...

I often don't carry it out.	1	2	3	4	5	6	7	I always do what I said.
--------------------------------	---	---	---	---	---	---	---	-----------------------------

2. If my teenager gets upset when I say *No*...

I back down and give in to my teenager.	1	2	3	4	5	6	7	I stick to what I said.
---	---	---	---	---	---	---	---	----------------------------

3. When my teenager doesn't do what I asked...

I often let it go or end up doing it myself.	1	2	3	4	5	6	7	I take some other action.
--	---	---	---	---	---	---	---	------------------------------

4. When I say my teenager can't do something...

I let my teenager do it anyway.	1	2	3	4	5	6	7	I stick to what I said.
------------------------------------	---	---	---	---	---	---	---	----------------------------

5. If saying *No* doesn't work...

I take some other kind of action.	1	2	3	4	5	6	7	I offer my teenager something nice so he or she will behave.
--------------------------------------	---	---	---	---	---	---	---	--

6. When my teenager does something I don't like...

I do something about it every time it happens.	1	2	3	4	5	6	7	I often let it go.
--	---	---	---	---	---	---	---	--------------------

7. When my teenager misbehaves...

I raise my voice or yell.	1	2	3	4	5	6	7	I speak to my teenager calmly.
---------------------------	---	---	---	---	---	---	---	--------------------------------

8. When my teenager misbehaves...

I handle it without getting upset.	1	2	3	4	5	6	7	I get so frustrated or angry my teenager can see I'm upset.
------------------------------------	---	---	---	---	---	---	---	---

9. When there is a problem with my teenager...

Things build up and I do things I don't mean to.	1	2	3	4	5	6	7	Things don't get out of hand.
--	---	---	---	---	---	---	---	-------------------------------

10. When my teenager does something I don't like, I insult my teenager, say mean things or call my teenager names...

Never or rarely.	1	2	3	4	5	6	7	Most of the time.
------------------	---	---	---	---	---	---	---	-------------------

11. When my teenager misbehaves...

I usually get into a long argument with my teenager.	1	2	3	4	5	6	7	I don't get into an argument.
--	---	---	---	---	---	---	---	-------------------------------

12. When I am upset or under stress...

I am picky and on my teenager's back.	1	2	3	4	5	6	7	I am no more picky than usual.
---------------------------------------	---	---	---	---	---	---	---	--------------------------------

13. When my teenager is out of sight...

I often don't know what my teenager is doing.	1	2	3	4	5	6	7	I always have a good idea of what my teenager is doing.
---	---	---	---	---	---	---	---	---

*Note.* From Irvine, A.B., Biglan, A., Smolkowski, K., & Ary, D.V. (1999). The value of the Parenting Scale for measuring the discipline practises of parents of middle school children. *Behaviour Research and Therapy*, 37, 127–142. Copyright 1998 Elsevier Science Ltd. Reproduced with permission.

## Appendix J

### Pre-Intervention Self-Efficacy Scale

#### Enuresis Treatment Self-Efficacy Scale (ETSFE) – Teen Self-Report

Answer these questions based on how confident you are that you will be able to do these things as part of your participation in the program.	Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly agree
1. I am confident that I will be able to train my bladder muscle to hold my urine at night.					
2. I am confident that I will be able to drink more water than usual.					
3. I will be able to write down how much water I drink each day in my diary.					
4. I am confident that I will learn to hold my urine for longer amounts of time.					
5. I will be more aware of the feeling of a full bladder during the day.					
6. I am confident that I will have a drink of water each time my parents wake me every hour for the first night.					
Answer these questions based on how confident you are that you will be able to do these things as part of your participation in the program.	Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly agree
7. I am confident that I will be able to wake up and turn off the alarm if it goes off.					
8. I will be able to get up and turn the light on if the alarm goes off.					
9. I am confident that I will be able to use the toilet if the alarm goes off.					
10. I will be able to put clean sheets on my bed if the alarm goes off.					
11. I am confident I will be able to wash my sheets on my own					
12. I am confident that I will be able to reset the alarm if it goes off.					
13. In the morning, I will be able to record whether I had a wet-night or a dry-night in my diary.					
14. I am confident that I will be able to notice when my bladder is full, get					

up and use the toilet, without the alarm going off.					
15. I am confident that I will be able to text my trainee psychologist about whether I had a wet or a dry night					
16. I am confident I will be able to talk on the phone with my trainee psychologist at least once a week about how my progress is going					

### Enuresis Treatment Self-Efficacy Scale (ETSFE) – Parent Self-Report

<b>Answer these questions based on how confident you are that you will be able to do these things as part of your participation in the program.</b>	<b>Strongly disagree</b>	<b>Disagree</b>	<b>Neither agree/disagree</b>	<b>Agree</b>	<b>Strongly agree</b>
1. I will be able to determine if my teen is drinking enough water during the day.					
2. I am confident that I will be able to help my teen record how much water they drink each day.					
3. I will be able to help my teen learn to hold their urine for longer and longer periods of time.					
4. I am confident that I will be able to awaken my teen every hour throughout the first night.					
5. I will be able to give my teen a drink of water at each awakening.					
6. I am confident that I will remain calm and neutral when my teen has a wet night.					
<b>Answer these questions based on how confident you are that you will be able to do these things as part of your participation in the program.</b>	<b>Strongly disagree</b>	<b>Disagree</b>	<b>Neither agree/disagree</b>	<b>Agree</b>	<b>Strongly agree</b>
7. I am confident that I will be able to ensure that my teen used the toilet during the awakening on the first night.					
8. I will be able to ensure my teen awakens if the alarm goes off any night during the programme.					
9. I am confident that I will be able to encourage my teen to record wet-nights and dry-nights in their diary.					
10. I will be able to praise and be positive toward my teen each time they have a dry night.					
11. I will be able to give my teen agreed upon rewards promptly when they reach specified numbers of dry nights.					
12. I will be available at an agreed time each week to talk on the phone about my teenager's progress.					

## Appendix K

### Post-Intervention Self-Efficacy Scale

#### Teen

#### Enuresis Treatment Self-Efficacy Scale (ETSFE) – Teen Self-Report

<b>Answer these questions based on how confident you are that you will be able to do these things now that you have finished the programme.</b>	<b>Strongly disagree</b>	<b>Disagree</b>	<b>Neither agree/ disagree</b>	<b>Agree</b>	<b>Strongly agree</b>
17. I am confident that my bladder muscle will be able to hold my urine at night.					
18. I am confident that I will be able to keep drinking more water than I used to.					
19. I am confident that I will hold my urine for longer amounts of time.					
20. I will be more aware of the feeling of a full bladder during the day.					
<b>Answer these questions based on how confident you are that you will be able to do these things now that you have finished the programme.</b>	<b>Strongly disagree</b>	<b>Disagree</b>	<b>Neither agree/ disagree</b>	<b>Agree</b>	<b>Strongly agree</b>
21. I am confident I will be able to wash my sheets on my own.					
22. I am confident that I will be able to notice when my bladder is full, wake up and use the toilet.					



# Parent

## Enuresis Treatment Self-Efficacy Scale (ETSFE) – Parent Self-Report

Answer these questions based on how confident you are that you will be able to do these things now that you and your teenager have finished the programme.	Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly agree
13. I will be able to encourage my teen to drink enough water during the day.					
14. I will be able to help my teen to hold their urine for long periods of time.					
15. I am confident that I will remain calm and neutral if my teen has a wet night.					
Answer these questions based on how confident you are that you will be able to do these things now that you and your teenager have finished the programme.	Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly agree
16. I will be able to praise and be positive toward my teen when they stay dry.					

## Appendix L

## Baseline Bedwetting Recording Sheet

## Bedwetting Diary

Name: \_\_\_\_\_

[illegible]

## Appendix M

## Treatment Bedwetting Recording Sheet

### Progress Diary:

Name:

**Age:**

**Sex:**

**Date treatment started:**

**Instructions:**

- Fill in your progress diary every morning.
- If your bed is dry in the morning, CONGRATULATIONS!!!  
If you have an accident, don't worry about it. Just write down the size of the wet patch – small (S)=less than 10cm, medium (M)=10-30cm or large (L)= greater than 30cm.
- Please note down late nights, ill-health etc. in the comments column below.

[illegible][illegible]

Week 3							



Fluid Drinking Record with Reward Agreement for:

[illegible]

Count each cup or glass of water as 250mls unless it is very small or very large (in this case, you will need to measure how much water). Remember to only count water

## Reward Agreement

Agreed reward for:

1 day reaching target fluid total

3 days in a row reaching target

5 days in a row reaching target

10 days in a row reaching target

Signed Teen:

Signed Parent:

Date:

## Appendix O

### Increase Fluid Intake Information Sheet

#### Increasing Fluid Intake to Help Treat Bedwetting

There is considerable evidence that children or teens not drinking enough is tied to both difficulties getting dry at night and development of constipation. Not drinking enough water probably leads to the bladder not really getting full enough to send strong signals about fullness to the brain, and that causes a delay in learning to respond to bladder signals which is particularly obvious at night. Also many parents of bedwetters restrict their children/ youth's drinking in the evening which can mean even less fluid into the bladder.

Part of your child or teen getting dry at night involves finding out much they actually drink during a day. If they drink less than about 1800mls per day (more if they are into sports or are larger build), then a programme of increasing water intake needs to be the first step in treating bedwetting.

- **Step 1:** Record on the sheet provided how much **water** your child or teen drinks each day for a week. Do not count milk drinks or tea/ coffee/ sugary (or alcoholic) drinks. Herb tea is ok, as is very watered down juice. You will need to take (send) a drink bottle to school each day and bring it back each afternoon and only drink from the bottle while at school and also note each glass or cup of water drunk at home.
- **Step 2:** Discuss the results of recording with your trainee psychologist and decide whether a programme is needed to increase water intake.
- **Step 3:** Support your bedwetter to develop a plan with your trainee psychologist. This may involve strategies to increase water drinking at school or ways of remembering to drink before or after school. It also involves no fluid restriction at dinner time or before bed. With the help of your trainee psychologist, find some small rewards to motivate your child/ youth. Keep recording fluid intake.
- **Step 4:** Praise your child or teen frequently for their steps to increase their drinking and reward them as agreed for progress, and all their hard work. Try not to 'tell them off' for not drinking but **focus your attention** (and theirs) on any time you see them actually drinking.
- **Step 5:** Yay. You are ready to continue with the bedwetting programme!

## Appendix P

## Follow-up Bedwetting Recording Sheet

## Follow-up Bedwetting Diary

**Name:** \_\_\_\_\_

[illegible]